ZERO

INSTRUCTION MANUAL

Top Flite Models Champaign, IL
Ph: (217) 398-8970, Ext. 5
Fax: (217) 398-7721
airsupport@top-flite.com

WARRANTY

Top Flite® Model Manufacturing Co. guarantees this kit to be free from defects in both material and workmanship at the date of purchase. This warranty does not cover any component parts damaged by use or modification. **In no case shall Top Flite's liability exceed the original cost of the purchased kit.** Further, Top Flite reserves the right to change or modify this warranty without notice.

In that Top Flite has no control over the final assembly or material used for final assembly, no liability shall be assumed nor accepted for any damage resulting from the use by the user of the final user-assembled product. By the act of using the user-assembled product, the user accepts all resulting liability.

If the buyer is not prepared to accept the liability associated with the use of this product, the buyer is advised to return this kit immediately in new and unused condition to the place of purchase.

To make a warranty claim send the defective part or item to Hobby Services at this address:

Hobby Services
3002 N. Apollo Dr. Suite 1
Champaign IL 61822 USA

Include a letter stating your name, return shipping address, as much contact information as possible (daytime telephone number, fax number, e-mail address), a detailed description of the problem and a photocopy of the purchase receipt. Upon receipt of the package the problem will be evaluated as quickly as possible.

SPECIFICATIONS

Wingspan:	86 in [2185 mm]
Wing Area:	1276 in^2 [82.3 dm^2]
Weight:	25.5–27.5 lb [11.56–12.47 kg]
Wing Loading:	46–50 oz/ft^2 [140–153 g/dm^2]
Length:	70.5 in [1790 mm]
Radio:	7 minimum
Engine:	3.0–3.6 cu in [50–60 cc] two-stroke gasoline engine

READ THROUGH THIS MANUAL BEFORE STARTING CONSTRUCTION. IT CONTAINS IMPORTANT INSTRUCTIONS AND WARNINGS CONCERNING THE ASSEMBLY AND USE OF THIS MODEL.

TABLE OF CONTENTS

INTRODUCTION

Top Flite is very proud to bring you the Mitsubishi Zero. The Zero became one of the most important fighters of World War II for the Japanese. This is a great flying model that you will enjoy and will turn heads at the flying field. We have made a realistic airplane that has no bad flight characteristics. We believe you will be very pleased with the final product.

For the latest technical updates or manual corrections to the Giant Scale Zero ARF visit the Top Flite web site at www.top-flite.com. Open the "Airplanes" link, then select the Giant Scale Zero ARF. If there is new technical information or changes to this model a "tech notice" box will appear in the upper left corner of the page.

ACADEMY OF MODEL AERONAUTICS

If you are not already a member of the AMA, please join! The AMA is the governing body of model aviation and membership provides liability insurance coverage, protects modelers' rights and interests and is required to fly at most R/C sites.

Academy of Model Aeronautics
5151 East Memorial Drive
Muncie, IN 47302-9252

Ph. (800) 435-9262
Fax (765) 741-0057

Or via the Internet at:
http://www.modelaircraft.org

IMPORTANT!!! Two of the most important things you can do to preserve the radio controlled aircraft hobby are to avoid flying near full-scale aircraft and avoid flying near or over groups of people.

IMAA

The Top Flite Giant Scale Zero ARF is an excellent sport-scale model and is eligible to fly in IMAA events. The IMAA (International Miniature Aircraft Association) is an organization that promotes non-competitive flying of giant-scale models. If you plan to attend an IMAA event, obtain a copy of the **IMAA Safety Code** by contacting the IMAA at the address or telephone number below, or by logging on to their web site at: **www.fly-imaa.org/imaa/sanction.html.**

IMAA
205 S. Hilldale Road
Salina, KS 67401

(913) 823-5569

SCALE COMPETITION

Though the Top Flite Zero is an ARF and may not have the same level of detail as an "all-out" scratch-built competition model, it is a scale model nonetheless and is therefore eligible to compete in the *Fun Scale* class in AMA competition (we receive many favorable reports of Top Flite ARFs in scale competition!). In Fun Scale, the "builder of the model" rule does not apply. To

receive the five points for scale documentation, the only proof required that a full size aircraft of this type in this paint/markings scheme did exist is a single sheet such as a kit box cover from a plastic model, a photo, or a profile painting, etc. If the photo is in black and white other written documentation of color must be provided. Contact the AMA for a rule book with full details.

If you would like photos of the full-size Zero for scale documentation, or if you would like to study the photos to add more scale details, photo packs are available from:

Bob's Aircraft Documentation
3114 Yukon Ave Ph: (714) 979-8058
Costa Mesa, CA 92626 Fax: (714) 979-7279

e-mail: www.bobsairdoc.com

IMPORTANT SAFETY PRECAUTIONS

PROTECT YOUR MODEL, YOURSELF & OTHERS... FOLLOW THESE IMPORTANT SAFETY PRECAUTIONS

1. Your Zero should not be considered a toy, but rather a sophisticated, working model that functions very much like a full-size airplane. Because of its performance capabilities, the Zero, if not assembled and operated correctly, could possibly cause injury to yourself or spectators and damage to property.

2. You must assemble the model **according to the instructions**. Do not alter or modify the model, as doing so may result in an unsafe or unflyable model. In a few cases the instructions may differ slightly from the photos. In those instances the written instructions should be considered as correct.

3. You must take time to **build straight, true** and **strong**.

4. You must use an R/C radio system that is in good condition, a correctly sized engine, and other components as specified in this instruction manual. All components must be correctly installed so that the model operates correctly on the ground and in the air. You must check the operation of the model and all components before **every** flight.

5. If you are not an experienced pilot or have not flown this type of model before, we recommend that you get the assistance of an experienced pilot in your R/C club for your first flights. If you're not a member of a club, your local hobby shop has information about clubs in your area whose membership includes experienced pilots.

6. While this kit has been flight tested to exceed normal use, if the plane will be used for extremely high stress flying, such as racing, or if an engine larger than one in the recommended range is used, the modeler is responsible for taking steps to reinforce the high stress points and/or substituting hardware more suitable for the increased stress.

7. **WARNING:** The cowl and other parts included in this kit are made of fiberglass, the fibers of which may cause eye, skin and respiratory tract irritation. Never blow into a part to remove fiberglass dust, as the dust will blow back into your eyes. Always wear safety goggles, a particle mask and rubber gloves when grinding, drilling and sanding fiberglass parts. Vacuum the parts and the work area thoroughly after working with fiberglass parts.

We, as the kit manufacturer, provide you with a top quality, thoroughly tested kit and instructions, but ultimately the quality and flyability of your finished model depends on how you build it; therefore, we cannot in any way guarantee the performance of your completed model, and no representations are expressed or implied as to the performance or safety of your completed model.

REMEMBER: Take your time and follow the instructions to end up with a well-built model that is straight and true.

DECISIONS YOU MUST MAKE

This is a partial list of items required to finish the ZERO that may require planning or decision making before starting to build. Order numbers are provided in parentheses.

RADIO EQUIPMENT

The Zero can be flown with a minimum of a seven channel radio. For our installation we used a twelve channel radio. One channel each was used for the throttle, choke, ignition switch, air valve, right elevator, left elevator, rudder, right aileron, left aileron, right flap, left flap and the optional drop tank.

RECOMMENDED SERVOS

All control surfaces require the use of a high quality servo of at least 85 oz-in of torque. A servo of 40 oz-in of torque can be used for the throttle, ignition switch, choke and air control valve.

Control Surfaces
❍ Futaba 9402 (FUTM0102)

Throttle, Choke and Air Valve
❍ Futaba 3003 (FUTM0031)

❍ 2 – 20" [508 mm] Heavy Duty Servo Extensions (FUTM4147) for the ailerons. If you install the optional drop tank you will need one additional 20" [508 mm] extension.

❍ 6 – 16" [406 mm] Heavy Duty Servo Extensions (FUTM4145) two for the flaps, one each for the throttle, choke, ignition switch and the air valve.

❍ 3 – 8" [203 mm] Pro Series Heavy Duty Servo Extensions (FUTM4140)

Depending on your choice of receiver and the number of channels you will be using you may have to use "Y" harnesses on the aileron, flaps and elevator.

❍ Up to three "Y" harnesses may be required. (FUTM4130)

❍ 3200 mAh 4.8 volt NiCd receiver battery or equivalent (FUTM1285).

❍ 2 - Heavy duty switch harness (FUTM4385).

❍ 2 - Earnst Charge Receptacle (ERNM3001).

S.BUS SYSTEM

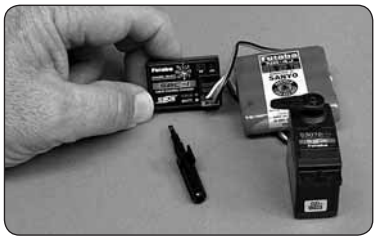
A cutting edge alternative to standard servo installation!

The innovative Futaba S.Bus system lets you unleash your flight system's full potential and cut down on cable clutter at the same time. It uses digital serial data communication technology to transmit control signals between your receiver and servos. A single S.Bus cable can carry signals to as many channels as your transmitter can handle. You no longer have to worry about plugging in the wrong servo to the wrong channel, because each servo knows what channel it is dedicated to in advance.

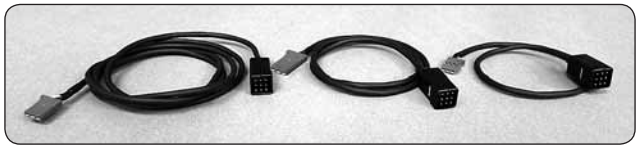
SBD-1 S.Bus Decoder Cables allow the use of existing analog and digital servos, too. By providing today's pilots with tomorrow's technology, the Futaba S.Bus system is nothing short of revolutionary.

HOW DO YOU INSTALL THE S.BUS SYSTEM?

Installation is actually simplified as compared to your normal system installation. Using the S.Bus system you plug a battery into the SBC-1 channel changing tool, using it to program which channel you want the servo to operate on.



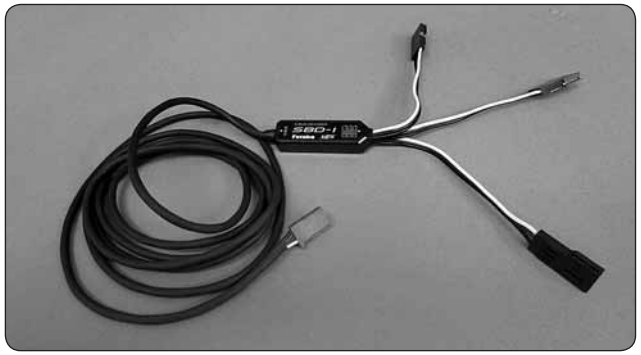
Once programmed the servo will operate as required regardless of which lead it is plugged into. Do this for all of the servos that you want to operate on the S.Bus system. Install the servos in the airplane and plug them into the S.Bus lead, piggybacking them one onto another. Once completed you plug one lead into the receiver for all of the servos and all of the servos will function as programmed. One lead operates up to 16 servos!



S.Bus leads are available in a number of different lengths to accommodate installation into any size airplane regardless of its complexity.

There are many choices for the S. Bus receivers; some are tiny 3 port receivers with others being up to 8 channels. The 8 channel inputs can be used as you would normally set up a model, allowing you to split the model and have some of it set up as S.Bus while other servos are not using the S. Bus system. Something else to note is that some of the S. Bus servos and receivers are HV or High Voltage, meaning that you could run a straight 2S LiPo for your receiver battery.

Many servo choices are available for use in a wide variety and sizes of aircraft from micros to the largest models.

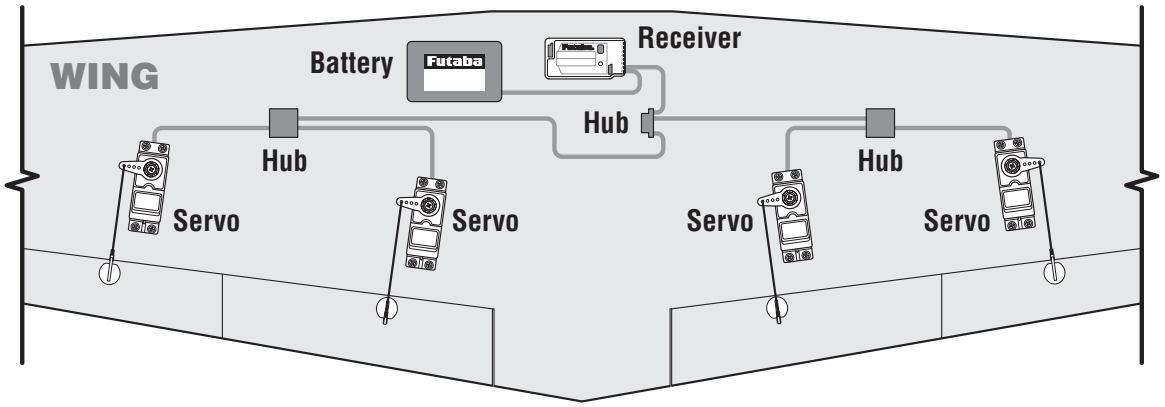


Your system is not limited to programming only through the SBC-1 channel changing tool and your transmitter. Utilizing the USB interface, the CIU-2, you can do all of the programming using your PC. Programming with this interface gives more flexibility and programming options than can be achieved with any other radio system. To utilize standard non S.Bus servos you simply use the S.Bus decoder instead of the S.Bus lead.

This is just the beginning of what this system can do. Would you like to operate the servos in the wing with a separate battery from the fuselage? With S.Bus you can do that! Run multiple servos – using only a single channel on your transmitter!!

WANT MORE INFORMATION?

Visit www.futaba-rc.com for more information, diagrams and helpful videos showing the complete operation of the S.Bus system.



ENGINE RECOMMENDATIONS

The recommended engine size range for the Zero is a 50 - 60cc (3.0 - 3.6 cu in] two-stroke gasoline engine. We used the DLE 55 engine for our model. Other engines can also be used but you may need to make modifications for mounting those engines.

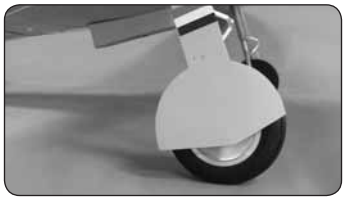
ROBART RETRACTABLE LANDING GEAR

Robart makes a very realistic, high quality, scale pneumatic landing gear for the ZERO. This landing gear rotates just the same as that of the full scale airplane, providing a very realistic operation. This is a tremendous addition to the airplane. You will need the following.

- ❍ Top Flite Giant Zero Pneumatic Mains (ROBQ1648)
- ❍ 157VR Large Air Control Kit (ROBQ2305)
- ❍ 169 Pressure Tubing 10' Red/Purple (ROBQ2369)
- ❍ 160WC Fork Pneumatic Tail Wheel (ROBQ2230)

Robart also makes an electric version of this landing gear. Though our instructions show the installation of the pneumatic version, the electric version is a drop-in replacement for the pneumatics and can be installed in this airplane following the instructions with the electric retracts.

- ❍ ZERO-E Top Flite Giant Zero Electric Mains (ROBQ1649)
- ❍ 160WC-E Fork Pneumatic Tail Wheel (ROBQ2231)



ROBART SCALE WHEELS

Robart makes a realistic, high quality, scale wheel for the ZERO (ROBQ1385). This is a tremendous addition to the airplane. If you choose to use them you can order them from your dealer.

OPTIONAL DROP TANK

We have created a scale drop tank mount and drop tank (TOPA1956) that adds an additional level of scale realism and fun to flying the Zero. The only thing required besides the Drop Tank kit is a servo.

PILOT

Best Pilots specifically designed a Japanese pilot for the Top Flite Zero. This pilot is available both painted and unpainted through their web site; www.bestpilots.typepad.com

ADDITIONAL ITEMS REQUIRED

REQUIRED HARDWARE AND ACCESSORIES

This is the list of hardware and accessories required to finish the ZERO. Order numbers are provided in parentheses.

- ❍ R/C foam rubber (1/4" [6mm] - HCAQ1000, or 1/2" [13mm] - HCAQ1050)
- ❍ 3' [900mm] gasoline fuel tubing (GPMQ4135)
- ❍ 1 oz. [30g] Thin Pro CA (GPMR6002)
- ❍ 1 oz. [30g] Medium Pro CA+ (GPMR6008)
- ❍ Pro 30-minute epoxy (GPMR6047)
- ❍ Pro 6-minute epoxy (GPMR6045)
- ❍ Silver solder w/flux (STAR2000)
- ❍ Hobbico Soldering Iron 60 Watt (HCAR0776)
- ❍ #1 Hobby knife (HCAR0105)
- ❍ #11 blades (5-pack, HCAR0211)
- ❍ R/C-56 canopy glue (JOZR5007)
- ❍ Duratrax Shoe Goo (DTXC2460) or some other form of silicone glue.
- ❍ Masking tape (TOPR8018)
- ❍ Threadlocker thread locking cement (GPMR6060)
- ❍ Denatured alcohol (for epoxy clean up)
- ❍ Rotary tool such as Dremel
- ❍ Rotary tool reinforced cut-off wheel (GPMR8200)
- ❍ Drill bits: 1/16" [1.6mm], 1/8" [3.2mm], 5/64" [2mm], 3/32" [2.4mm], 3/16" [4.8mm].
- ❍ Two packages of 3' x 1/8" I.D. Tygon fuel tubing (DUBQ0493)
- ❍ Fuel barbs (DUBQ0672)

OPTIONAL SUPPLIES AND TOOLS

Here is a list of optional tools mentioned in the manual that will help you build the ZERO.

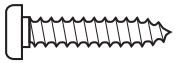
- ❍ 21st Century sealing iron (COVR2700)
- ❍ 21st Century iron cover (COVR2702)
- ❍ 2 oz. [57g] spray CA activator (GPMR6035)
- ❍ 4 oz. [113g] aerosol CA activator (GPMR634)
- ❍ Epoxy brushes (6, GPMR8060)
- ❍ Mixing sticks (50, GPMR8055)
- ❍ Mixing cups (GPMR8056)
- ❍ Panel Line Pen (TOPQ2510)

IMPORTANT BUILDING NOTES

- There are three types of screws used in this kit:

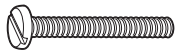
  Sheet Metal Screws are designated by a number and a length. For example #6 × 3/4" [19mm].

  This is a number six screw that is 3/4" [19mm] long.

  Machine Screws are designated by a number, **threads per inch,** and a length. For example 4-40 × 3/4" [19mm].

  This is a number four screw that is 3/4" [19mm] long with forty threads per inch.

  Socket Head Cap Screws (SHCS) are designated by a number, **threads per inch**, and a length. For example 4-40 × 3/4" [19mm].

  This is a 4-40 SHCS that is 3/4" [19mm] long with forty threads per inch.

- When you see the term ***test fit*** in the instructions, it means that you should first position the part on the assembly **without using any glue**, then slightly modify or *custom fit* the part as necessary for the best fit.

- Whenever the term ***glue*** is written you should rely upon your experience to decide what type of glue to use. When a specific type of adhesive works best for that step, the instructions will make a recommendation.

- Whenever just ***epoxy*** is specified you may use ***either*** 30-minute (or 45-minute) epoxy ***or*** 6-minute epoxy. When 30-minute epoxy is specified it is **highly** recommended that you use only 30-minute (or 45-minute) epoxy, because you will need the working time and/or the additional strength.

- **Photos** and **sketches** are placed **before** the step they refer to. Frequently you can study photos in following steps to get another view of the same parts.

- The Giant Scale Zero is factory-covered with Top Flite MonoKote film. Should repairs ever be required, MonoKote can be patched with additional MonoKote purchased separately. MonoKote is packaged in six-foot rolls, but some hobby shops also sell it by the foot. If only a small piece of MonoKote is needed for a minor patch, perhaps a fellow modeler would give you some. MonoKote is applied with a model airplane covering iron, but in an emergency a regular iron could be used. A roll of MonoKote includes full instructions for application. Following are the colors used on this model and order numbers for six foot rolls.

  Flat Olive Drab (TOPQ0510)
  Flat Black (TOPQ0508)
  Flat Dove Gray (TOPQ0511)

- The stabilizer and wing incidences and engine thrust angles have been factory-built into this model. However, some technically-minded modelers may wish to check these measurements anyway. To view this information visit the web site at www.top-flite.com and click on "Technical Data." Due to manufacturing tolerances which will have little or no effect on the way your model will fly, please expect slight deviations between your model and the published values.

KIT INSPECTION

Before starting to build, take an inventory of this kit to make sure it is complete, and inspect the parts to make sure they are of acceptable quality. If any parts are missing or are not of acceptable quality, or if you need assistance with assembly, contact **Product Support**. When reporting defective or missing parts, use the part names exactly as they are written in the Kit Contents list.

Top Flite Product Support
3002 N Apollo Drive, Suite 1
Champaign, IL 61822

Ph: (217) 398-8970, ext. 5 Fax: (217) 398-7721
E-mail: productsupport@top-flite.com

ORDERING REPLACEMENT PARTS

Replacement parts for the Top Flite Giant Scale Zero ARF are available using the order numbers in the **Replacement Parts List** that follows. The fastest, most economical service can be provided by your hobby dealer or mail-order company.

To locate a hobby dealer, visit the Top Flite web site at www.top-flite.com. Select "Where to Buy" in the menu across the top of the page and follow the instructions provided to locate a U.S., Canadian or International dealer.

Parts may also be ordered directly from Hobby Services by calling (217) 398-0007, or via facsimile at (217) 398-7721, but full retail prices and shipping and handling charges will apply. Illinois and Nevada residents will also be charged sales tax. If ordering via fax, include a Visa® or MasterCard® number and expiration date for payment.

Mail parts orders and payments by personal check to:
Hobby Services
3002 N Apollo Drive, Suite 1
Champaign IL 61822

Be certain to specify the order number exactly as listed in the **Replacement Parts List**. Payment by credit card or personal check only; no C.O.D.

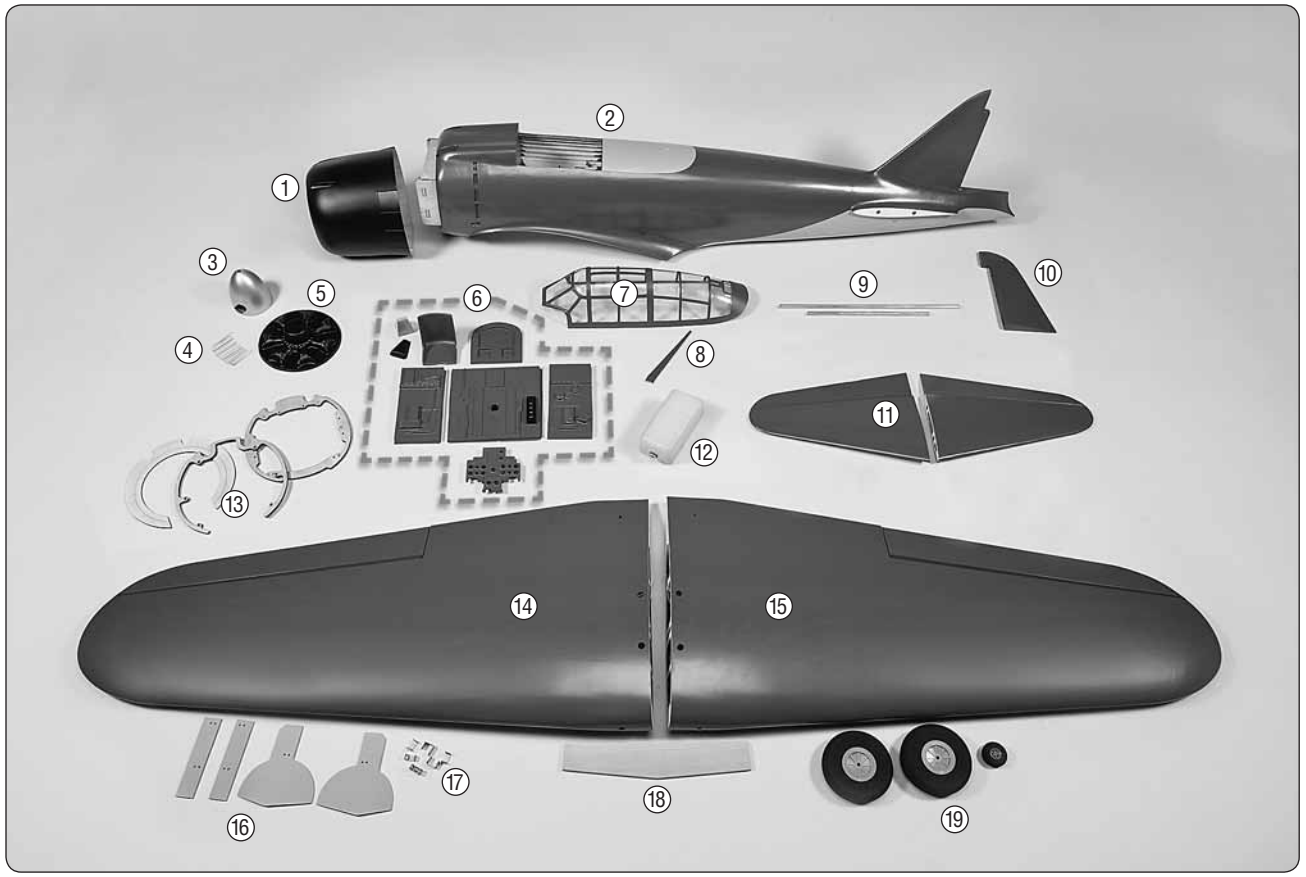
If additional assistance is required for any reason contact **Product Support:**

by e-mail at productsupport@top-flite.com
or by telephone at (217) 398-8970

REPLACEMENT PARTS LIST

TOPA1940	Fuse Kit	TOPA1951	Landing Gear Doors
TOPA1941	Wing Kit		
TOPA1942	Stab Set	TOPA1952	Door Brackets
TOPA1943	Rudder Set	TOPA1953	2-Blade Spinner
TOPA1944	Canopy		
TOPA1945	Cockpit Set	TOPA1954	3-Blade Spinner
TOPA1946	Cowl Set		
TOPA1947	Dummy Engine	TOPA1955	Decal Set
		TOPA1956	Drop Tank Set
TOPA1950	Antenna		

CONTENTS



1. Cowl
2. Fuselage
3. Spinner
4. Pushrod Tubes
5. Dummy Engine
6. Cockpit Interior
7. Canopy
8. Antenna
9. Stabilizer Tubes
10. Rudder
11. Stabilizers and Elevators
12. Fuel Tank
13. Cowl Mounting Rings
14. Right Wing
15. Left Wing
16. Landing Gear Doors
17. Door Brackets
18. Wing Joiner
19. Wheels

PREPARATIONS

NOTE ABOUT THE AIRFRAME

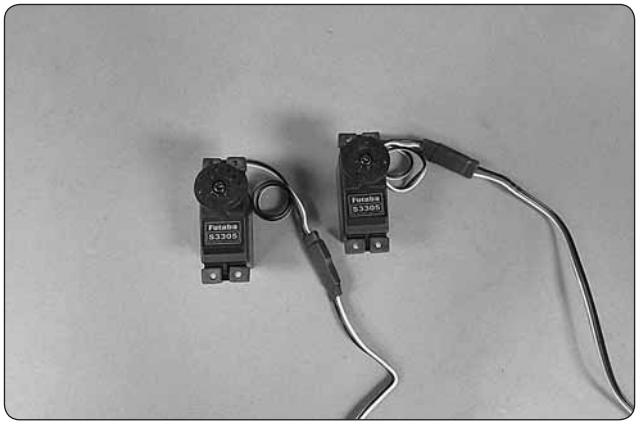
As part of the design and manufacturing of this model we recognized that this very short coupled airframe was going to need nose weight for the airplane to balance properly. There is not a lot of room on the firewall to mount weight so we have pre-installed the required nose weight into the airframe. If you use the recommended engine this airplane should be very close to the proper balance point.

1. If you have not done so already, remove the major parts of the kit from the box and inspect for damage. If any parts are damaged or missing, contact Product Support at the address or telephone number listed in the “Kit Inspection” section on page 6.

2. Use a covering iron with a covering sock on high heat to tighten the covering if necessary. Do this for all of the components of the model. Apply pressure over sheeted areas to **thoroughly** bond the covering to the wood.

ASSEMBLE THE WING

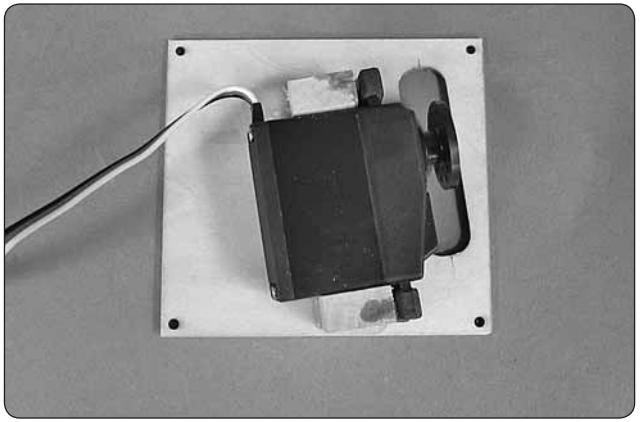
Note: *Throughout this instruction manual you will be instructed to use screws to secure different parts. In all cases, whenever a screw is threaded into wood sheeting or wood blocks we recommend that you install the screw and then remove it. Apply a drop of thin CA glue into the hole to harden the threads. After the glue has hardened, re-install the screw. Following this step will insure that you have a solid thread for your screws.*



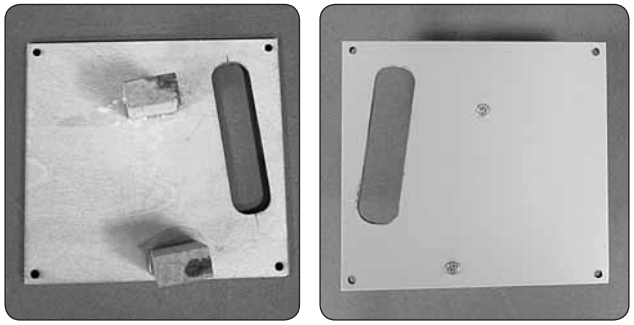
Begin with your right **wing panel** first so your assembly matches the photos in the manual.

❏ ❏ 1. Install a 24" [610mm] servo extension to your aileron servo. Secure it with heat shrink tubing, tape or other method for securing them together.

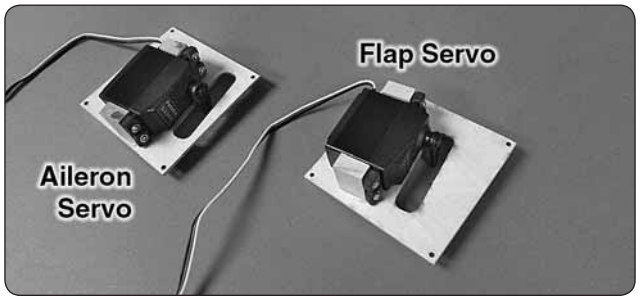
❏ ❏ 2. Install a 12" [305mm] servo extension to your flap servo. Secure it with heat shrink tubing, tape or other method for securing them together.



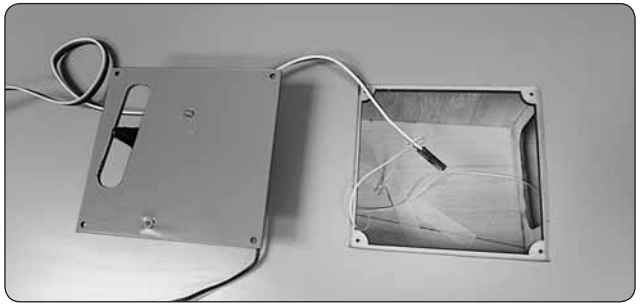
❏ ❏ 3. Remove the tape holding the **servo covers** to the bottom of the wing. Locate two 5/16" x 1/2" x 3/4" [8mm x 13mm x 19mm] hardwood blocks. The markings on the back of the cover are correct for Futaba servos. Place your particular brand of servo on the cover making sure they fit between the locations for the blocks. Adjust the positioning of the blocks for your brand of servo.



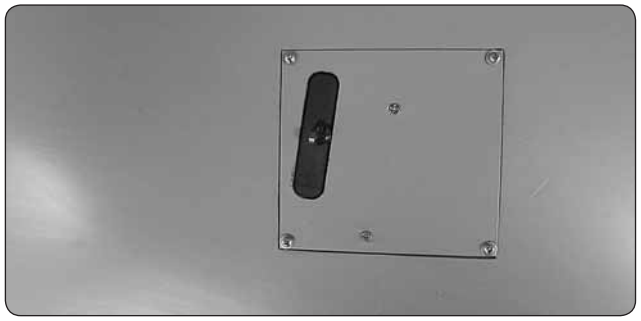
❏ ❏ 4. Glue the blocks to the servo cover. Once the glue has cured, drill a 1/16" [1.6mm] hole through the cover and into the servo mounting blocks Secure the block to the cover with a #2 x 3/8" [#2 x 9.5mm] wood screw. Do this for both of the servo covers.



❏ ❏ 5. Center the servos and install the servo arm onto your servos. The servos require a 3/4" [19mm] servo arm (typically the longest servo arm with your servo). Place your servo onto the mounting blocks. Drill a 1/16" [1.6mm] hole through the servo mounting tabs into the mounting blocks. Secure the servos to the mounting blocks with the screws that came with your servos.

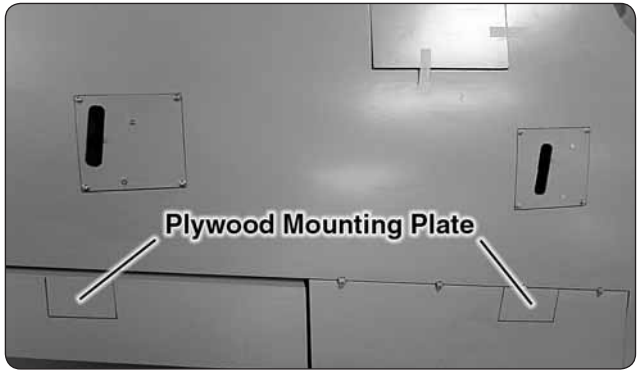


❏ ❏ 6. Inside the aileron and flap servo compartment you will find a string. Tie the string to the servo leads. The other end of the string is taped to the root wing of the rib. Pull the leads through the wing.



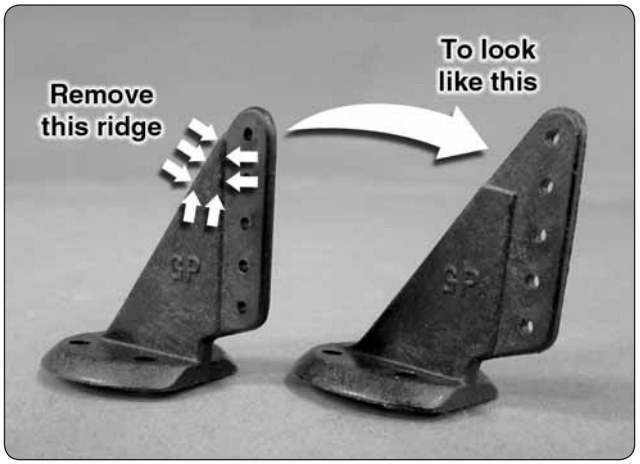
❏ ❏ 7. Install the servo covers to the wing, securing them to the wing with four #2 x 3/8" [9.5mm] screws and four #2 flat washers.

❏ ❏ 8. Tape the servo leads to the top of the wing to prevent the leads from falling back into the wing.

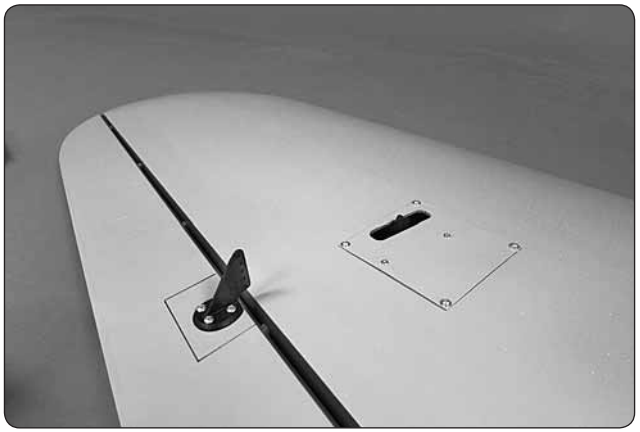


❏ ❏ 9. Located in both the aileron and the flap is a plywood mounting plate. If you look at the control

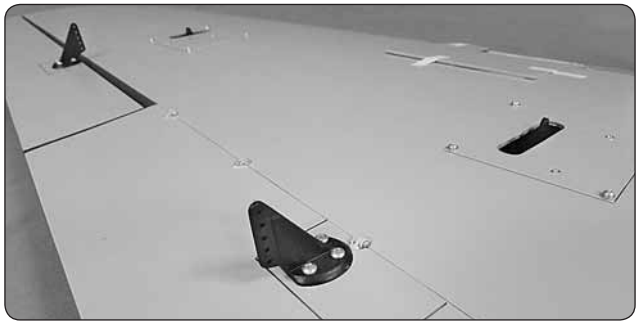
surface at a slight angle you will be able to see the plate through the covering.



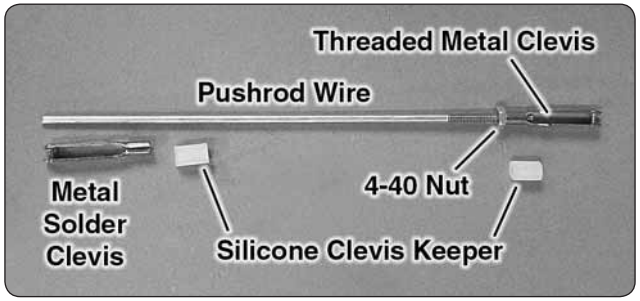
❏ ❏ 10. The flap and aileron will each require a black nylon control horn. The *flap* control horn needs to be modified. Cut a control horn as shown. A high speed rotary tool works well for this.



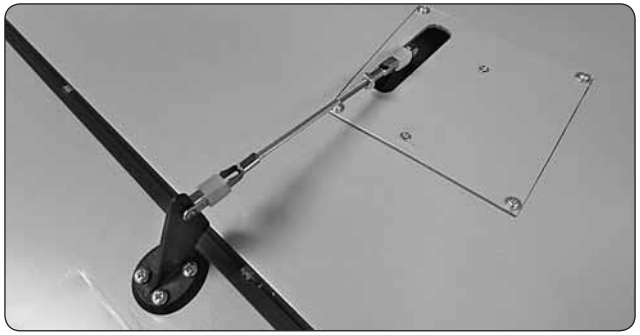
❏ ❏ 11. Place an unmodified black nylon control horn onto the plywood mounting plate in the aileron in line with the servo arm. Drill a 3/32" [2.4mm] hole through each of the holes in the control horn. Drill only through the plywood plate. **Do not** drill through the top of the control surface. Mount the horn with four #4 x 1/2" screws.



❏ ❏ 12. Install the *modified* control horn to the flap. However, the flap horn is rotated 180 degrees from the direction the aileron horn was installed. Install the horn using the same method used for the aileron.



❏ ❏ 13. Each aileron and flap pushrod is made from a 5-3/4" [146 mm] 4-40 pushrod wire threaded on one end, a threaded metal clevis, a 4-40 nut, a metal solder clevis and two silicone clevis keepers.



❏ ❏ 14. Screw the 4-40 nut and the threaded metal clevis onto the pushrod wire. Attach the clevis to the second hole down on the aileron control horn. Attach the metal solder clevis into the outer hole of the aileron servo arm. Center the aileron servo arm and the aileron. Mark on the pushrod wire where to cut the wire. Remove all of the pushrod wire components. Solder the metal solder clevis to the pushrod. If you are not familiar with soldering follow the “Hot Tip” that follows.

Hot Tip

HOW TO SOLDER

1. Roughen the end of the pushrod with coarse sandpaper where it is to be soldered. Use denatured alcohol or other solvent to thoroughly clean the pushrod.

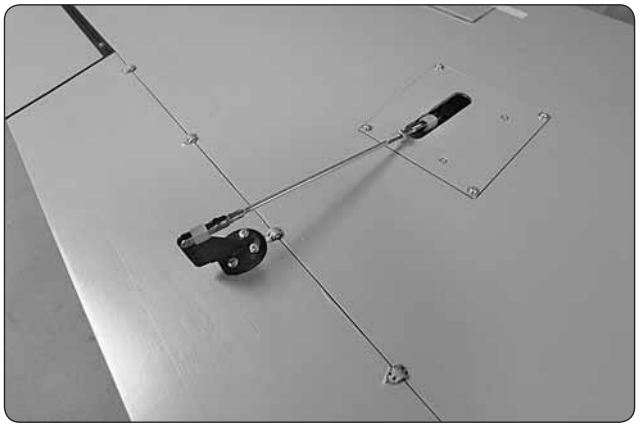
2. Apply a few drops of soldering flux to the end of the pushrod, then use a soldering iron or a torch to heat it. “Tin” the heated area with silver solder by applying the solder to the end. The heat of the pushrod should melt the solder – not the flame of the torch or soldering iron – thus allowing the solder to flow. The end of the wire should be coated with solder all the way around.

3. Place the clevis on the end of the pushrod. Add another drop of flux, then heat and add solder. The same as before, the heat of the parts being soldered should melt the solder, thus allowing it to flow. Allow the joint to cool naturally without disturbing. Avoid excess blobs, but make certain the joint is thoroughly soldered. The solder should be shiny, not rough. If necessary, reheat the joint and allow to cool.

4. Immediately after the solder has solidified, but while it is still hot, use a cloth to quickly wipe off the flux before it hardens. **Important:** After the joint cools, coat the joint with oil to prevent rust. **Note:** Do not use the acid flux that comes with silver solder for electrical soldering.

This is what a properly soldered clevis looks like – shiny solder with good flow, no blobs and flux removed.

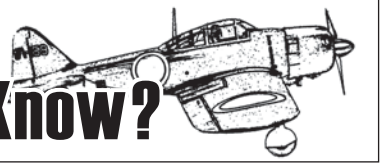
❏ ❏ 15. Once the solder has cooled slide a silicone clevis keeper over each clevis. Install the pushrod wire assembly to the aileron servo arm and aileron control horn.



❏ ❏ 16. Use the same procedure for the flap servo except you will not center the servo. Instead, make sure the flap is fully closed to the bottom of the wing. Then position the servo arm so that it is rotated toward the wing trailing edge. Now you can proceed with making the pushrod wire assembly.

❏ 17. Repeat steps 1-16 for the left wing.

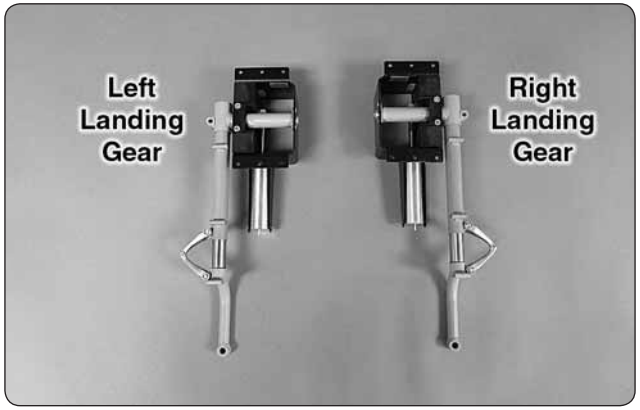
Did You Know?



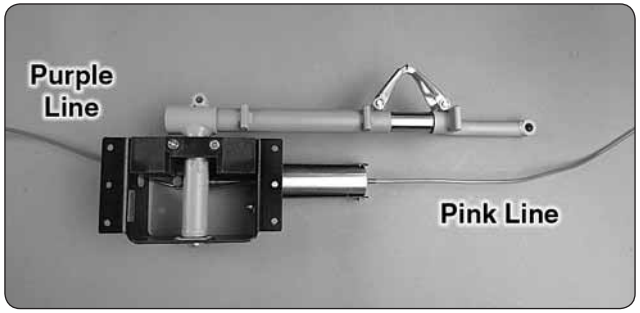
The Mitsubishi Zero was a long-range fighter aircraft, manufactured by Mitsubishi Heavy Industries, and operated by the Imperial Japanese Navy from 1940 to 1945. The A6M was usually referred to by its pilots as the "Zero-sen", zero being the last digit of the Imperial year 2600 (1940) when it entered service with the Imperial Navy. The official Allied reporting name was "Zeke", although the use of the name "Zero" was later commonly adopted by the Allies as well.

INSTALL THE RETRACTABLE LANDING GEAR AND LANDING GEAR DOORS

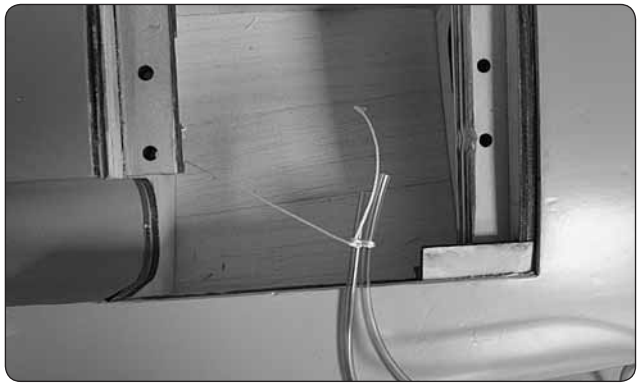
This airplane was designed to use the Robart Landing Gear. These instructions show the installation of the pneumatic landing gear. Robart also produces an electric version of this landing gear. Part numbers for both versions are listed on page 5 of the manual. We have chosen to show the pneumatic installation as it has a few additional steps to complete the installation. Both the pneumatic and the electric versions of this landing gear will work in this airplane.



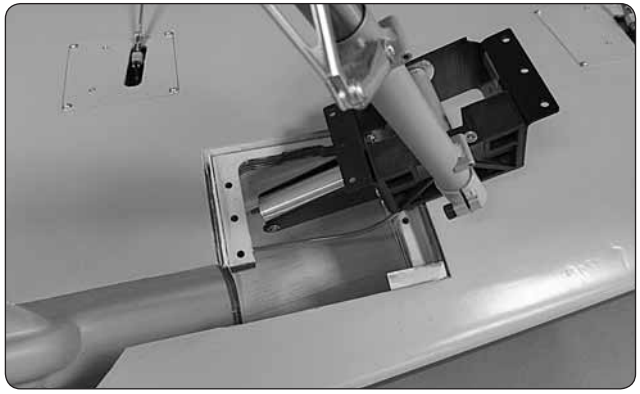
❏ ❏ 1. Determine which of the landing gear mounts in the right wing. Install your gear into the right wing first so your assembly matches the photos in the manual.

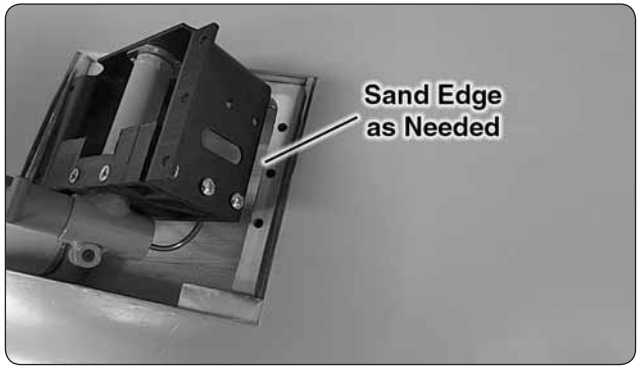


❏ ❏ 2. Cut the Robart pink and purple airline (not included in the kit) in half, making two pink and two purple 30" [762mm] lengths. Install one of the pink and purple lines onto the fittings as shown.

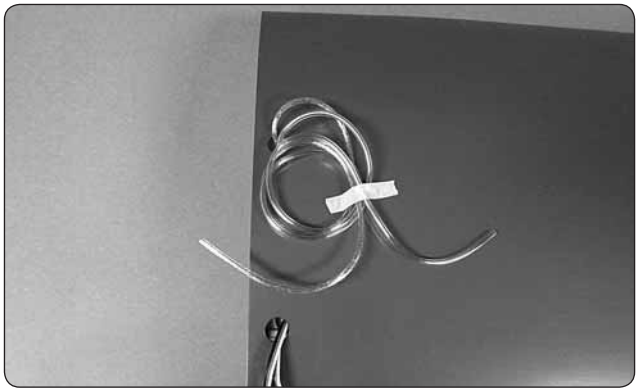


❏ ❏ 3. Inside of the wheel well there is a string. Tie the string to the end of the two airlines.

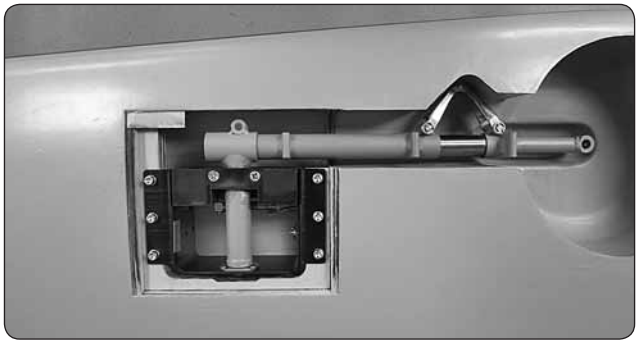




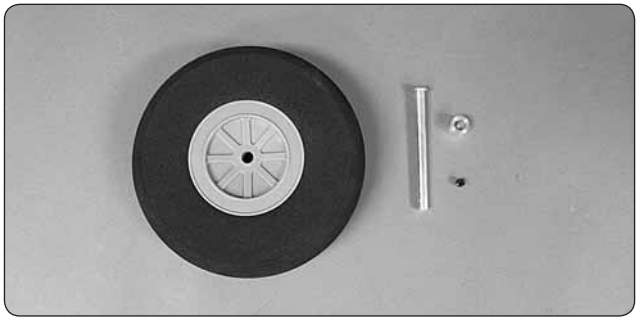
❏ ❏ 4. Install the gear into the wheel well. It will be a tight fit and may require you to sand the edge of the opening a bit to fit the landing gear. When installing the gear into the opening you will find that moving the landing gear strut to different positions while inserting it will make it install into the opening easier.



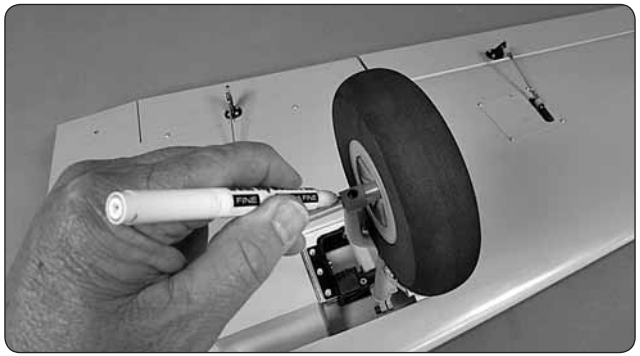
❏ ❏ 5. Pull the air lines through the hole in the top of the wing. Tape the lines to the wing so they do not fall back into the wing.

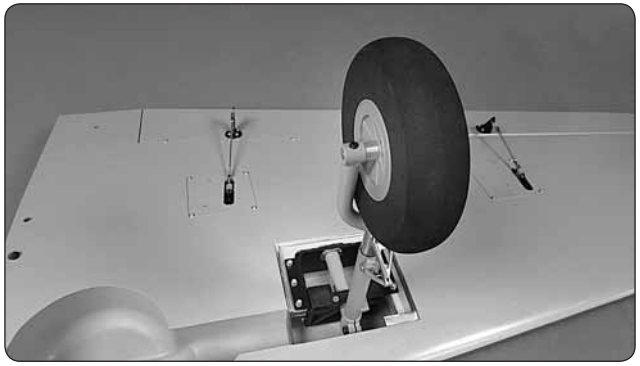


❏ ❏ 6. Secure the landing gear to the wing with six 6-32 x ¾" [19mm] socket head cap screws and #6 lock washers. Be sure to apply a drop of thread locker to each of the bolts before installing them in the wing.

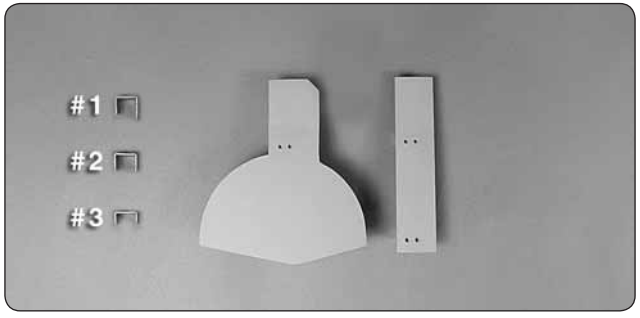


❏ ❏ 7. Locate one of the 5" [127mm] wheels and wheel spacers from the kit contents and the axle and the 8-32 set screw that comes with the landing gear.

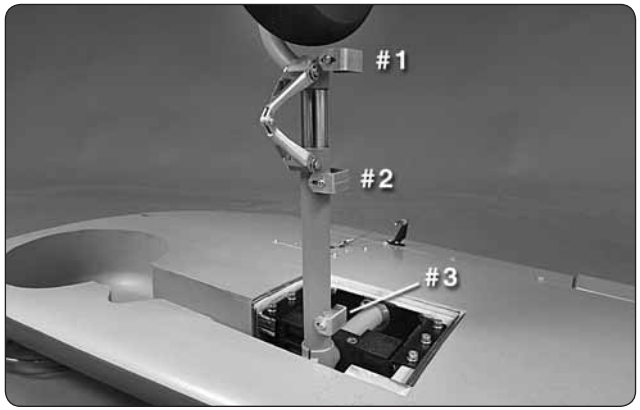


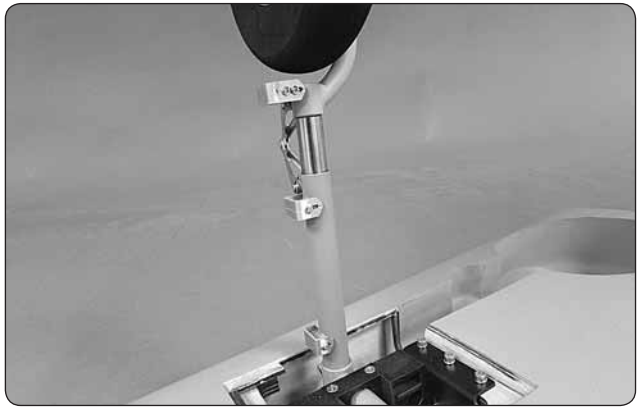


❏ ❏ 8. Install them into the landing gear strut as shown. Mark the axle with a fine point felt tip pen where it meets with the strut. Remove the axle and cut off the excess with a high speed motor tool or hack saw. Once cut to length reinstall the wheel and secure the axle with the set screw. Be sure to apply a drop of thread locker to the set screw.



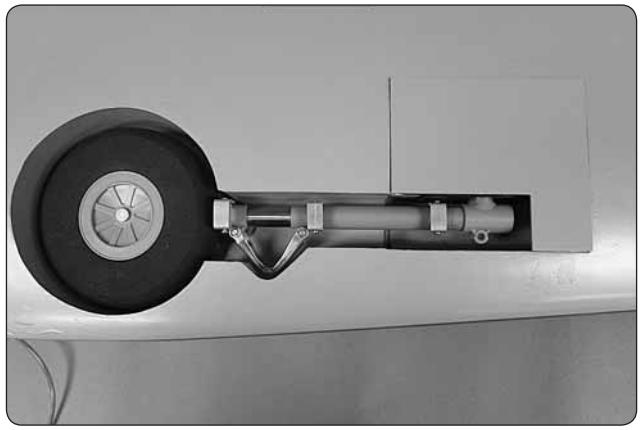
❏ ❏ 9. Locate the upper and lower landing gear doors and three landing gear door brackets. Six brackets are included in the kit. You will need one of each of the three sizes for mounting the doors.

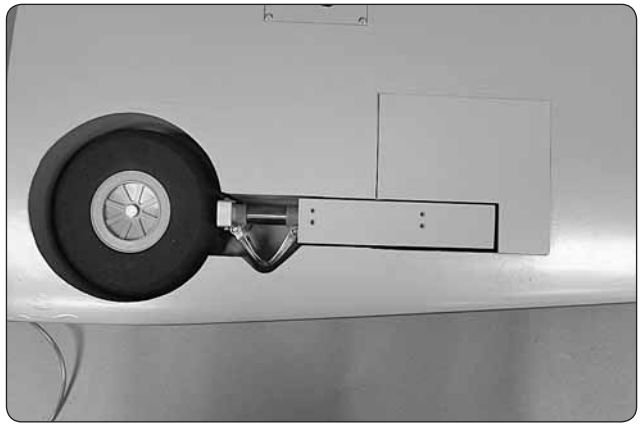




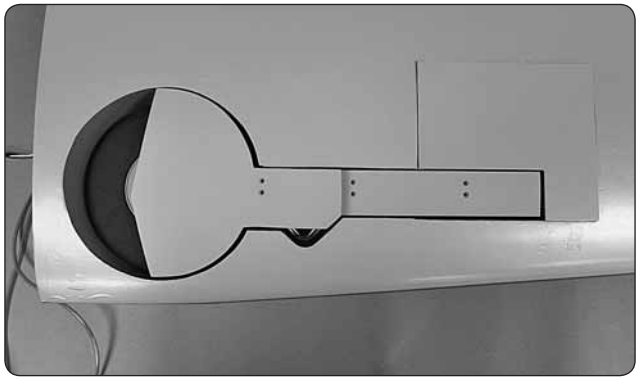
❏ ❏ 10. Install one of each of the brackets to the three mounting locations on the landing gear as shown. The shortest bracket is mounted closest to the wing followed by the middle length bracket and the longest bracket. Secure the brackets with 2-56 x ¼" machine screws as shown. Note: each bracket is secured with two screws

with the exception of the bracket closest to the wheel which requires three screws. When installing the screws, just snug the screws. Do not tighten them. Additionally, because these screws are small and easy to lose, we have included a few extra screws in the kit.

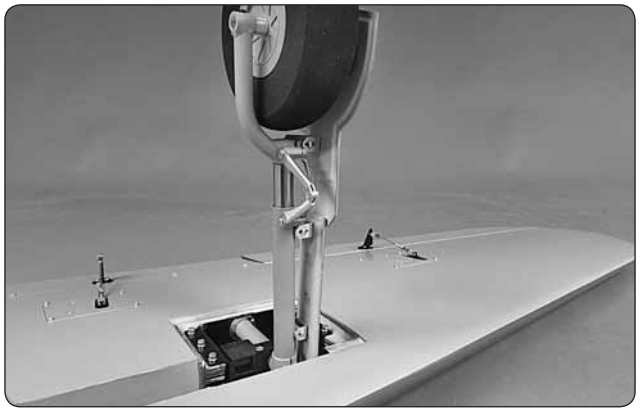


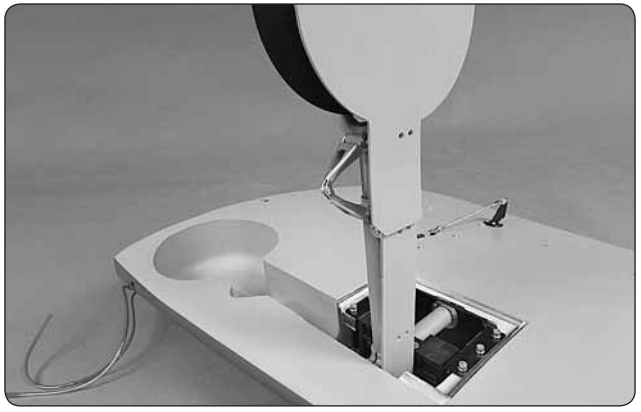


❏ ❏ 11. Rotate the landing gear into the wheel well and place the landing gear cover in place. Position the main landing gear cover in place onto the aluminum brackets. The mounting holes in the door should be aligned with the center of the bracket. When you are able to determine the door is positioned properly, remove the door and then temporarily glue the door to the bracket with a small drop of thin CA on each bracket.

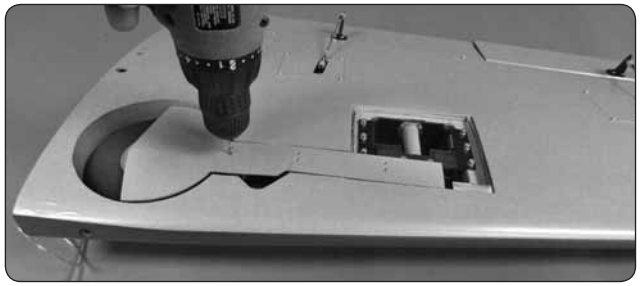


❏ ❏ 12. Place the wheel cover door in place onto the bracket. When positioning the wheel cover it should overlap the main landing gear cover slightly. When you are satisfied, tack glue the wheel cover to the bracket.

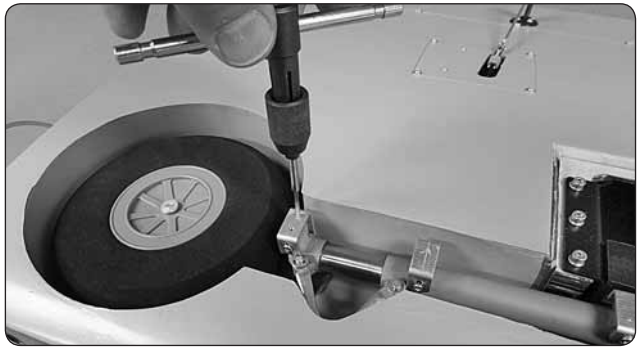




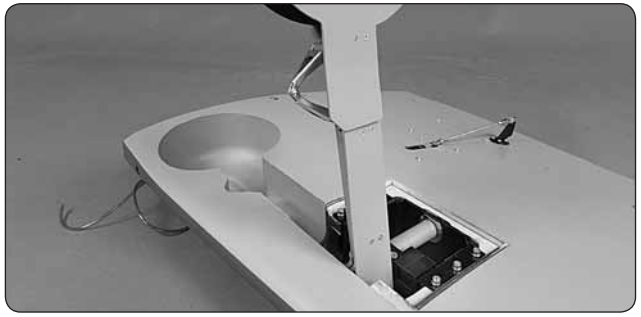
❏ ❏ 13. When properly positioned on the brackets, the gear doors should look as shown here.



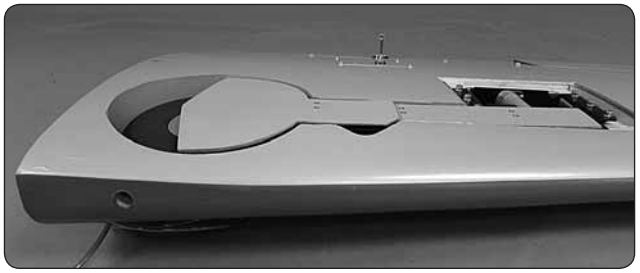
❏ ❏ 14. Lay the landing gear door into the wheel well. Drill a #50 or 5/64" [2mm] hole through each of the mounting holes in the gear doors, into the bracket. Remove the doors.



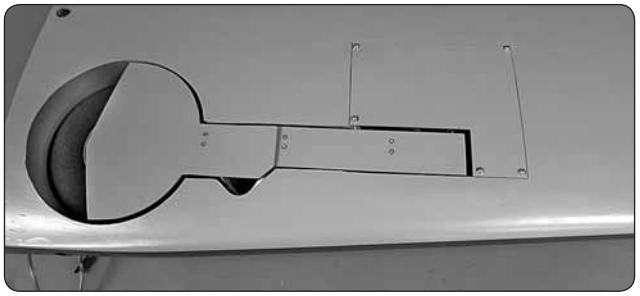
❏ ❏ 15. Tap each hole with a 2-56 tap. You will find this is most easily done if you remove the brackets from the landing gear and hold the bracket in a vise.



❏ ❏ 16. Re-install the brackets. Attach the doors to the landing gear with 2/56 x ¼: [6.4mm] flat head machine screws. Apply a drop of thread locker to each of the screws before installing them. (Because these screws are small and easy to lose, we have included a few extra screws in the kit.)



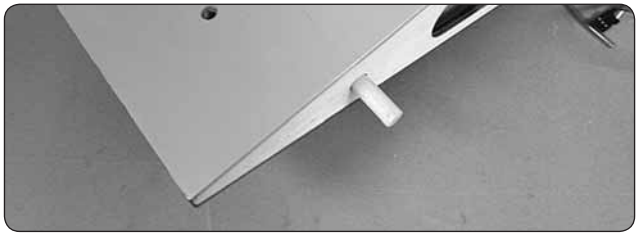
❏ ❏ 17. If necessary loosen the bracket mounting screws so that you can adjust the position of the brackets so the doors are flush with the wing. Remove each screw one at a time, apply a drop of thread locker to each screw and re-install it to the landing gear. When you are satisfied with the positioning of the doors, tighten the screws.



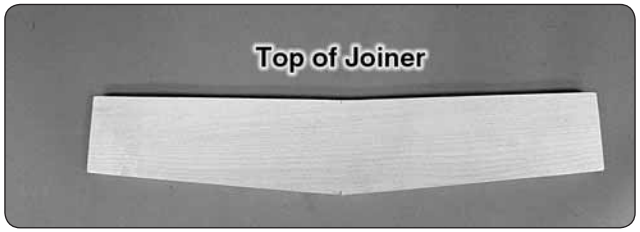
❏ ❏ 18. Install the landing gear cover over the landing gear. Drill a 1/16" [1.6mm] hole through each of the mounting holes. Secure the cover with five #2 x 3/8" [9.5mm] screws.

❏ 19. Repeat steps 1-16 for the left wing.

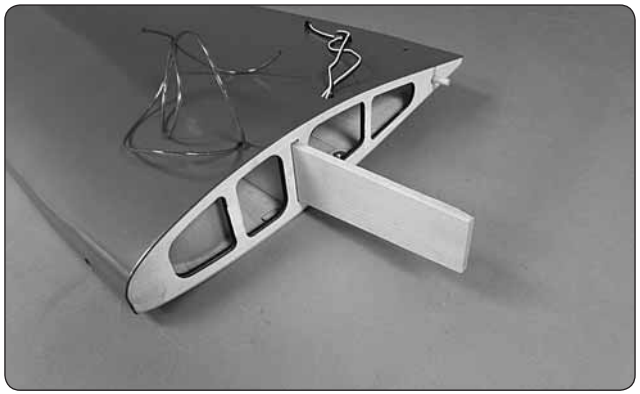
JOIN THE WING HALVES



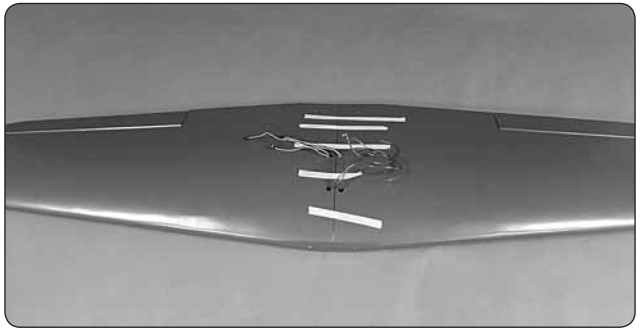
❏ 1. Glue the 5/16" x 1-1/2" [8mm x 38mm] dowel into the hole at the rear of the root rib in the right wing.



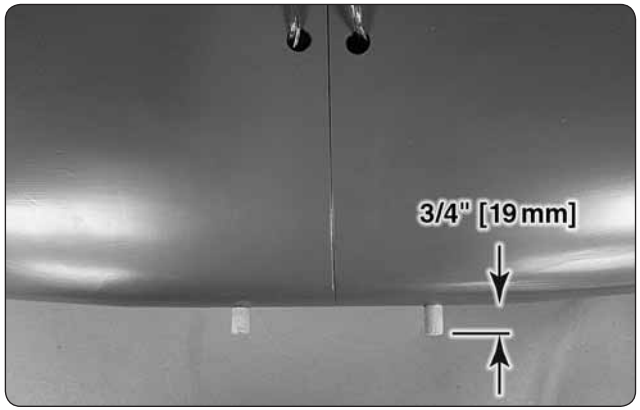
❏ 2. Locate the **hardwood wing joiner.** Test fit the joiner into the wings.



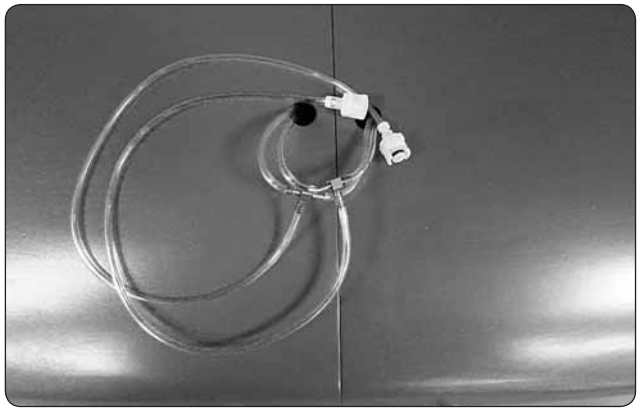
❏ 3. You will see two holes in the wing panels. These holes are to allow the servo leads and the air lines to exit the wing. **Important:** *Be sure that you feed all of the servo leads and all of the air lines through these two holes before gluing the wings together in the next step.*



❏ 4. When you are satisfied with the fit of the joiner, glue the joiner into the wing joiner pockets with 30 minute epoxy. When gluing the wings together be sure that you use plenty of glue in the joiner pockets on the joiner and the root ribs of the wing. Use masking tape to hold the wings together while the glue cures.



❏ 5. Test fit the two 3/8" x 1-1/ 2" [9.5mm x 51mm] wood dowels into the two holes in the leading edge of the wing. Place them into the holes so that 3/4" [19mm] of the dowel extends out of the wing. Make a mark on the dowel to indicate this distance. Remove the dowel. Then apply epoxy into the holes and on the dowel. Slide the dowel into the hole, leaving 3/4" [19 mm] extending from the wing. Clean off any excess epoxy with denatured alcohol and a paper towel.



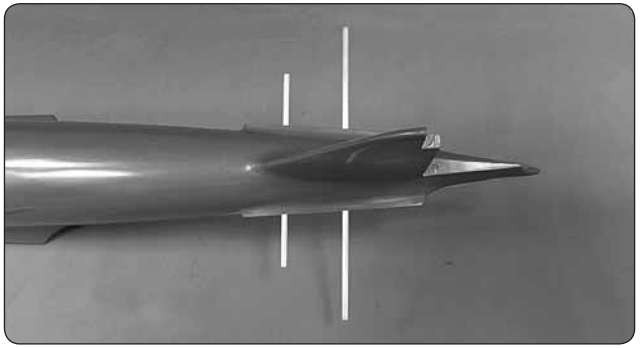
❏ 6. Read through the instructions that came with the landing gear to familiarize yourself with the required connections. Cut the two pink lines so about 3" [76mm] extend from the wing. Install a “T” fitting between the lines. Take one of the pieces you cut and install it on the “T” fitting and then install an air line quick disconnect fitting on the end of it. Do the same for the purple line.

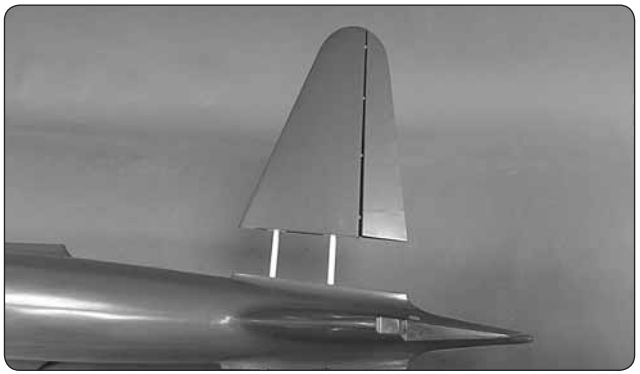
Did You Know?

When it was introduced early in World War II, the Zero was considered the most capable carrier-based fighter in the world, combining excellent maneuverability and very long range. In early combat operations, the Zero gained a legendary reputation as a dogfighter, achieving the outstanding kill ratio of 12 to 1, but by mid-1942 a combination of new tactics and the introduction of better equipment enabled the Allied pilots to engage the Zero on more equal terms.

ASSEMBLE THE FUSELAGE

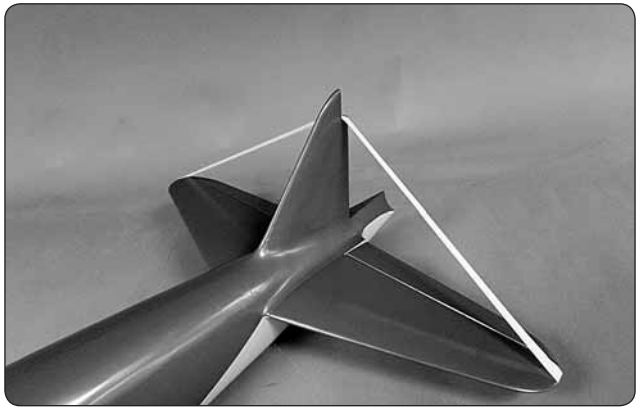
INSTALL THE STABILIZER AND RUDDER



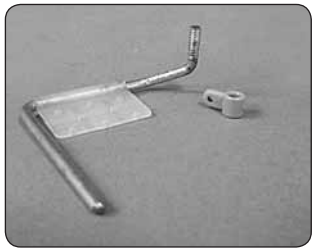


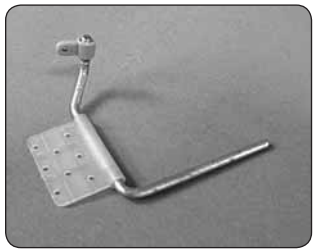
❏ 1. Test fit the two aluminum stabilizer tubes in the **fuselage** and slide the **stabilizers** on the tubes. The shorter tube goes in the front hole.

❏ 2. Once you are satisfied with the fit of the stabilizer halves, remove the stabilizer halves and joiner tubes. Use medium grit sandpaper to roughen up the aluminum tubes. Clean the tubes with denatured alcohol and insert both tubes back into the fuselage until the end exits on the opposite side by approximately 1" [25.4mm].



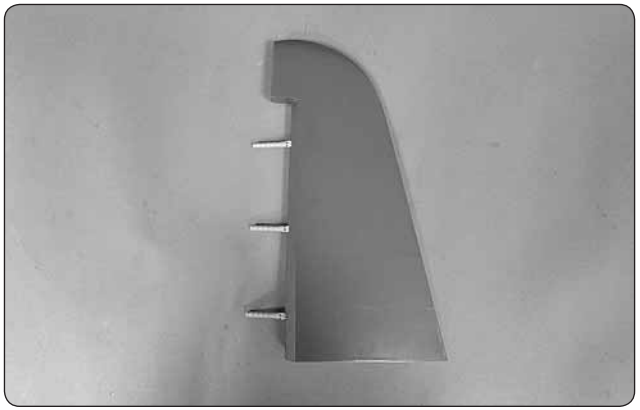
❏ 3. Gather everything required for gluing the stabilizer halves to the fuselage, including 30-minute epoxy, mixing sticks, epoxy brush, 12" [305mm] long dowel or wire, masking tape, denatured alcohol and small paper towel squares. Mix up 3/4 oz. [22cc] of 30-minute epoxy. Apply a generous amount of epoxy to the long side of the aluminum joiner tubes. Pull the tubes through the fuselage so that they are close to centered. Pour a small amount of epoxy into both holes of one of the stabilizer halves and using a dowel or wire, coat the inside of the holes. Apply epoxy to the root rib of the stabilizer and the fuselage. Insert the end of the aluminum tubes with epoxy on them into the stabilizer and press the stabilizer against the fuselage. Wipe off any excess epoxy that may have squeezed out before it runs down the fuselage. Quickly repeat the process on the other side. Wipe off any excess epoxy with a dampened paper towel and denatured alcohol. Use pieces of masking tape to hold the stabilizer tight against the fuselage until the epoxy cures.



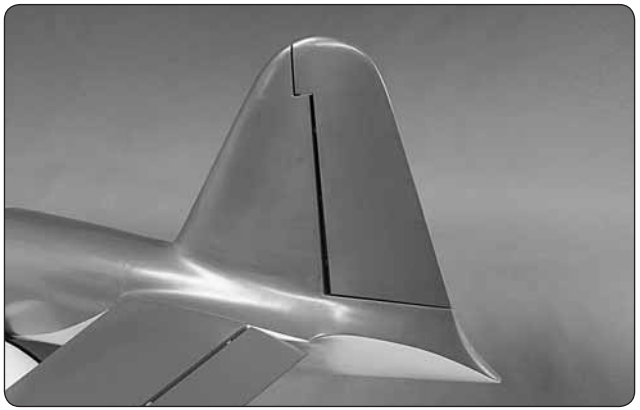


❏ 4. Locate the rudder control wire and the plastic control horn. Thread the control horn onto the threaded end of the wire.

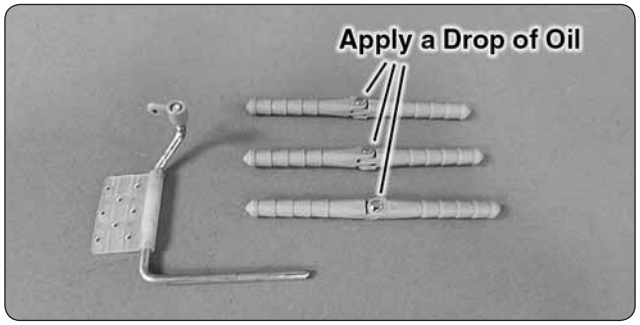
❏ 5. Again, without using any glue insert the control horn into the hole in the fuselage and then insert the nylon bearing into the bottom hinge slot in the vertical fin.



❏ 6. Without using any glue, install three hinges into the holes in the trailing edge of the rudder. Note that the pivot point of each hinge must align with the center of the trailing edge. To achieve this alignment, the hinges will be fairly deep in the fin. Also note that the hinges must be perpendicular to the leading edge.



❏ 7. Again without glue, test fit the rudder to the fin making sure the rudder control wire fits into the hole in the bottom trailing edge of the rudder. With everything assembled make sure the rudder moves freely and the rudder control wire moves in the fuselage without obstruction.



❏ 8. Remove the rudder, control wire and all of the hinges. Add a small drop of oil to the pivot point on the hinges and to the control wire where it passes through the nylon bearing. This will prevent the epoxy from adhering to the pivot point and the wire. Make sure oil does not get on the gluing surface of the hinge or the nylon bearing. If it does, clean the oil off with a paper towel square dampened with denatured alcohol.

❏ 9. Mix up approximately 1/4 oz. [7.4cc] of 30-minute epoxy. Use a toothpick to thoroughly apply the epoxy in the holes in the fin and rudder and the hole in the rudder for the rudder control wire. Use the toothpick to get the epoxy out of the opening of the holes in the rudder and fin so it doesn't get into the hinge pin. Wipe away any excess epoxy around the outside of the holes with a couple of the small paper towel squares dampened with denatured alcohol.

❏ 10. Use a toothpick to apply epoxy to the ends of the rudder hinges that go into the fin. Insert each hinge into the fin and wipe away any excess epoxy that squeezes out of the hole.

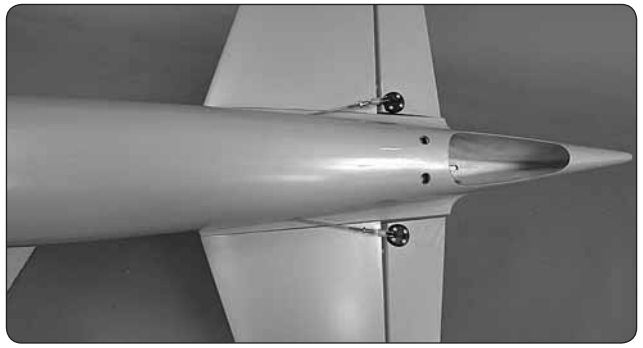
❏ 11. Apply epoxy to the nylon bearing tongue on the rudder control wire. Be careful not to get glue between the nylon bearing and the wire.

❏ 12. Apply epoxy to the other end of the hinges. Join the rudder to the fin, pushing the hinges only about 3/4 of the way into the rudder. Use a toothpick to wipe away any epoxy that squeezes out. Be sure the nylon bearing is inserted into the hinge slot in the vertical fin and the wire fits into the hole in the rudder. Then fit the rudder the rest of the way in.

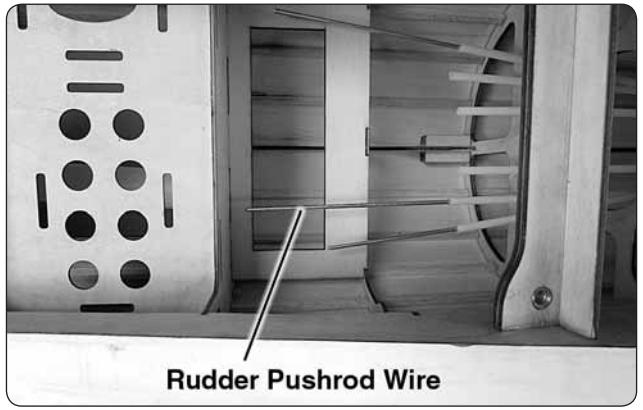
❏ 13. Move the rudder left and right to align the hinges. If needed, use a length of masking tape to hold the rudder to the fin. Allow the glue to fully cure.

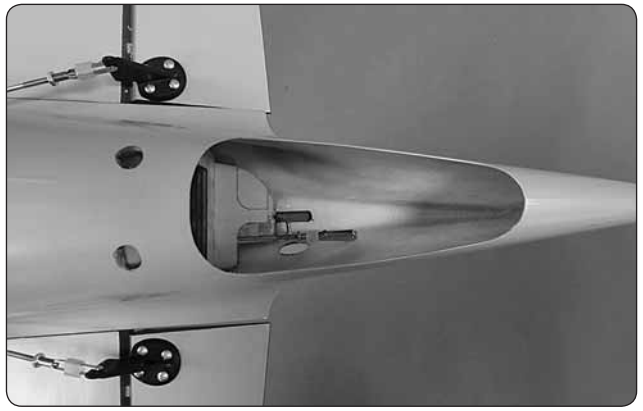
❏ 14. Cut a 4-40 x 48" [1220mm] metal pushrod to a length of 33" [838mm]. Install a 4-40 nut, silicone clevis keeper and 4-40 threaded clevis on the threaded end of the metal pushrod. Install the clevis into the hole second from the bottom of a large black control horn. Insert the pushrod wire into the pushrod hole in the right side of the fuselage until the control horn is resting on the elevator.

❏ 15. Where the elevator control horn rests on the elevator there is a plywood plate. Position the horn over the plate on the elevator. Drill a 3/32" [2.4mm] hole through each of the holes in the control horn. Drill only through the plywood plate. **Do not** drill through the top of the control surface. Mount the horn with four #4 x 1/2" [13mm] screws.

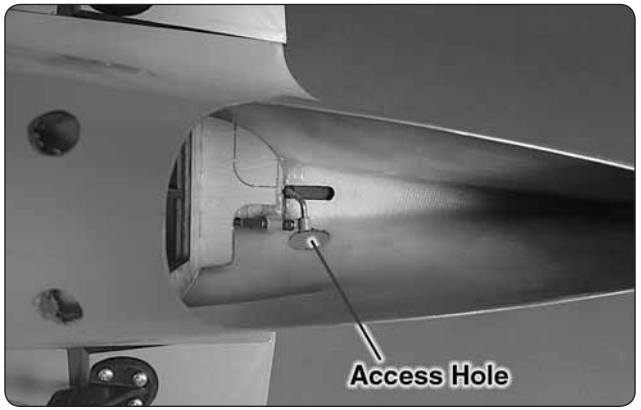


❏ 16. Install the horn and pushrod on the left side of the fuselage using the same technique.



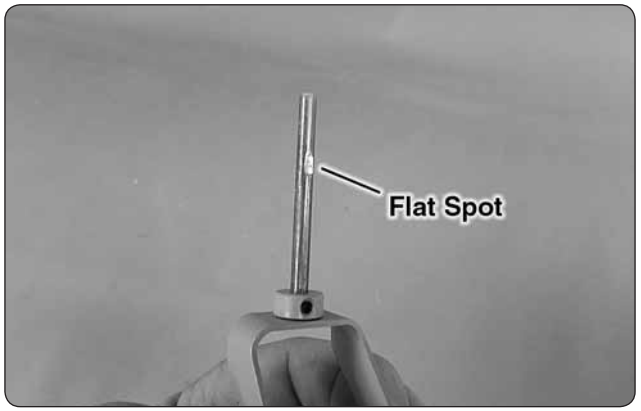


❏ 17. Cut a 4-40 x 48" [1220mm] metal pushrod to a length of 33" [838mm]. Slide the threaded end of the wire into the rudder tube, sliding it to the back of the fuselage. Install a 4-40 nut, silicon clevis keeper and 4-40 threaded metal clevis onto the wire.

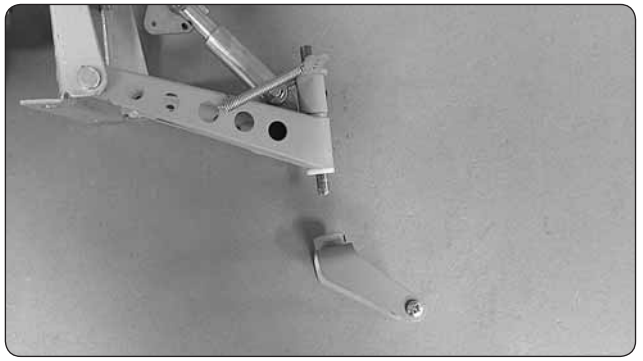


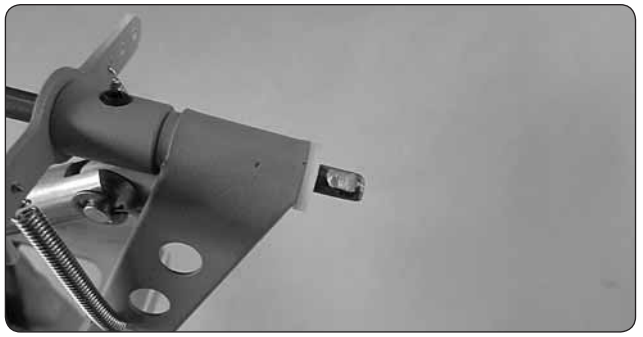
❏ 18. Attach the clevis to the horn on the rudder control wire. The easiest way to do this is to insert a flat blade screw driver into the hole in the tail cone, spreading the clevis to allow the pin to lock into the clevis. Apply a drop of thread locker to the nut and tighten it against the clevis. Slide the clevis keeper over the clevis.

MOUNT THE RETRACTABLE TAIL GEAR

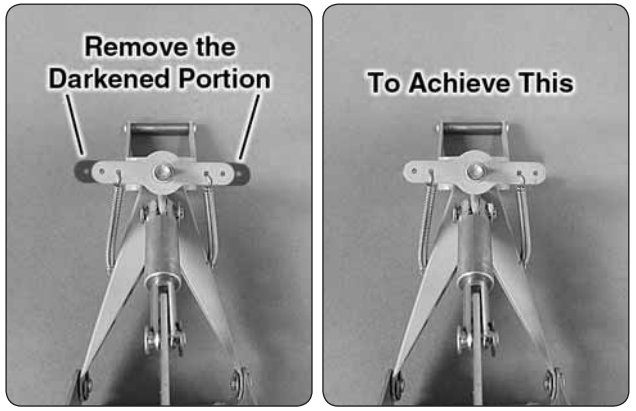


❏ 1. Remove the steering arm from the Robart retractable tail gear assembly (not included). File a flat spot on the shaft for the set screw in the steering arm to lock onto. Mount the steering arm to the shaft with a drop of thread locker and the set screw.





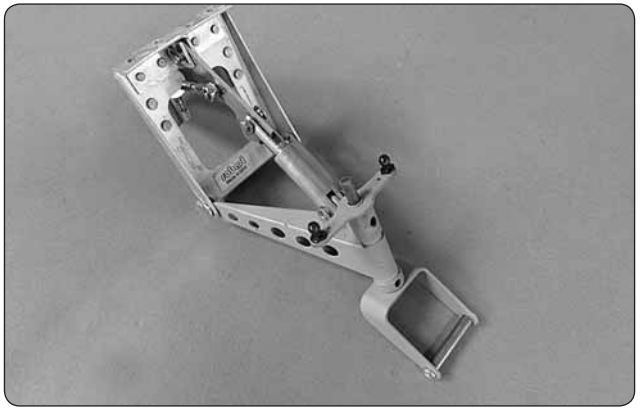
❏ 2. File another flat spot near the bottom of the shaft for one of the set screws in the strut. Tighten both set screws with a drop of thread locker on each. Be certain the steering arm and the axle in the strut remain parallel with each other. Make adjustments to the flat spots if necessary.



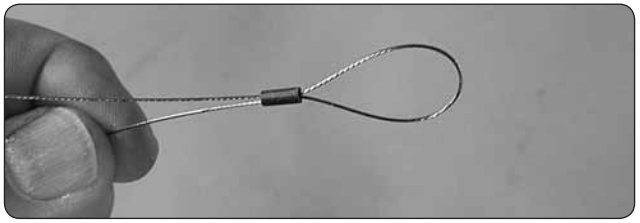
❏ 3. Using a high speed rotary tool, hacksaw or other cutting tool, cut off the part of the steering arm outside of the center hole and re-shape the end of the steering

arm. You may find it is easier to do this if you remove the arm and put it in a vise to make cutting the metal easier.

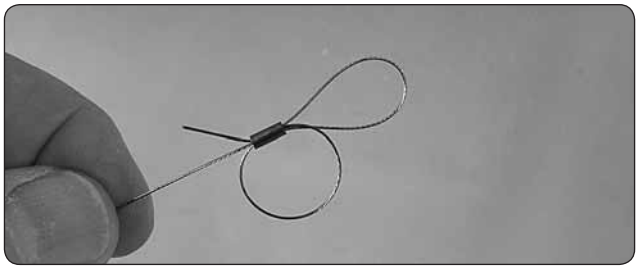
❏ 4. Re-install the steering arm onto the tail wheel assembly. If you removed the centering springs, re-install the springs.



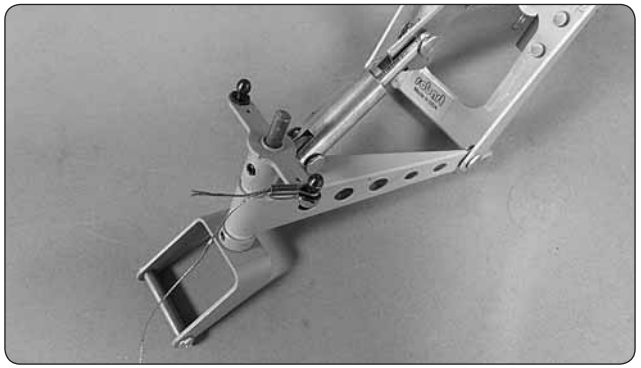
❏ 5. Insert a 0-80 ball link ball in the outer hole. Secure each ball with a 0-80 nut and a drop of threadlocker.

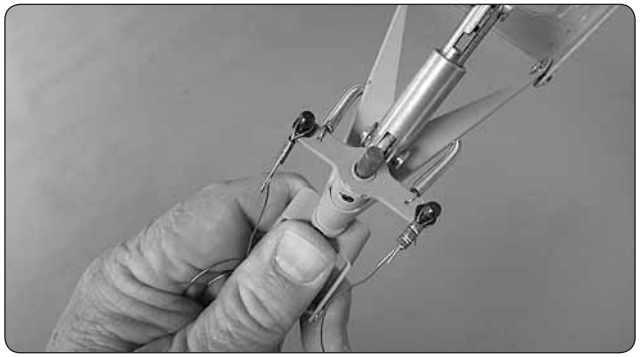


❏ 6. Use wire cutters to cut the supplied braided cable into two equal lengths. Slide a small copper tube (called a swage) over one end of the cables. Then guide the end of the cable back through.

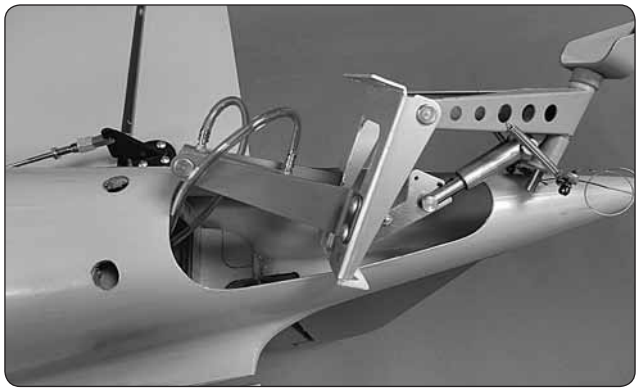


❏ 7. Wrap the cable back around and through the swage.

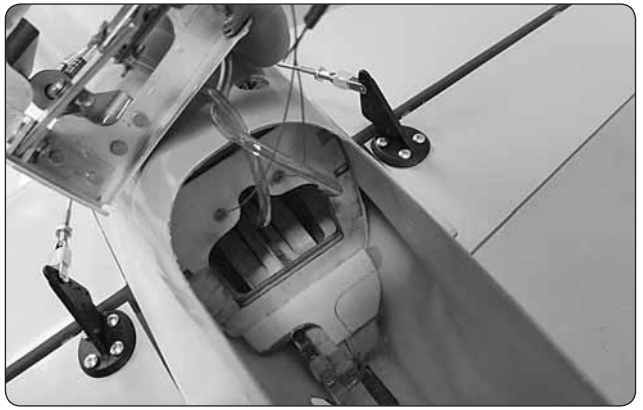




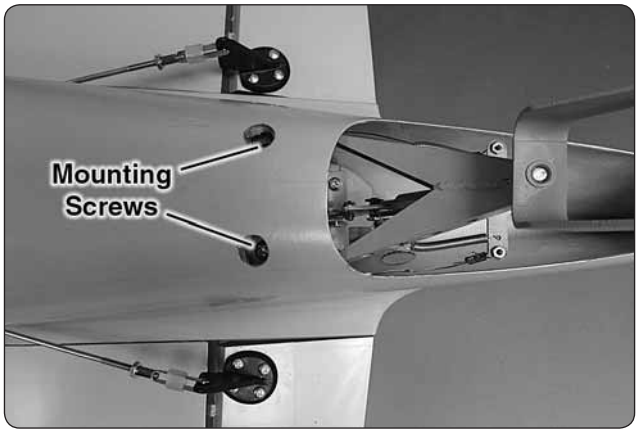
❏ 8. Now pull on the long end of the cable to reduce the size of the first loop. Slip the loop over one of the ball link balls on the steering arm. Tighten the loop until it is small enough to remain secure on the ball, yet may still be pried off. Squeeze the swage with pliers. Connect the other cable to the other ball link ball the same way.



❏ 9. Connect 40" [1016mm] of purple air line to the forward air fitting and 40" [1016mm] of pink air line to the aft fitting on the air cylinder. There is not enough air line leftover from the main gear, so additional line will have to be purchased separately (Robart #169 Pressure Tubing).

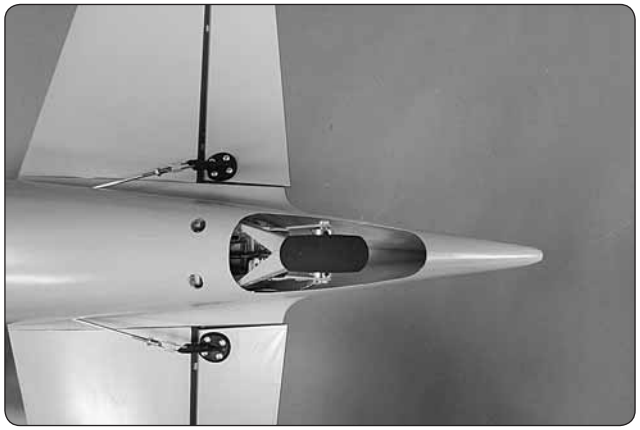


❏ 10. Place the tail gear in the fuselage while simultaneously guiding the pull/pull cable through the white plastic guide tubes. Guide the air lines through the fuselage.

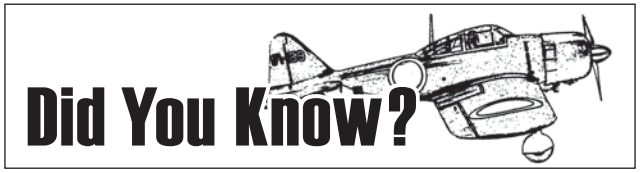


❏ 11. Drill three 3/32" [2.4mm] holes through the rails for mounting the tail gear. Make two holes in the rail on the bottom of the fuselage and one in the rail in the center of the fuselage. When you examine the mounting rails for the tail wheel assembly you will notice that part of the rail inside the fuselage on the right side is cut away to make clearance for the rudder pushrod. Because of this you will only drill a hole for mounting the tail wheel assembly in the left mounting hole. If your drill bit is not long enough to reach the rail nearest the center of the fuselage, use medium CA to temporarily glue a 3/32" [2.4mm] drill bit in a 1/8" [3.2mm] brass tube. After drilling the holes, the drill bit can be removed from the tube by heating the tube.

❏ 12. Mount the tail gear in the fuselage with three #6 x 1/2" [12.7mm] sheet metal screws.

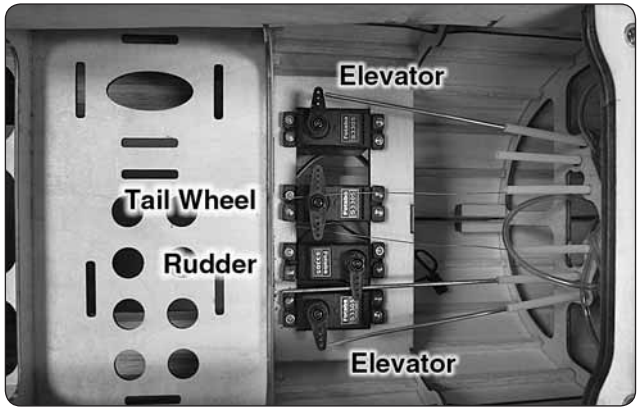


❏ 13. Enlarge the center hole through the 1-3/4" [44 mm] tail wheel with a 3/16" [5 mm] drill. Remove the screws that hold the tail wheel axle in place. Place the tail wheel onto the axle and place a 3/16" [4.8 mm] wheel collar on each side of the wheel. *(There is no need for a set screw for the collars since the collars are just a spacer for the tail wheel.)* Re-install the axle to the tail wheel assembly with the screws. Apply a couple of drops of thread locker to the screws before installing them.



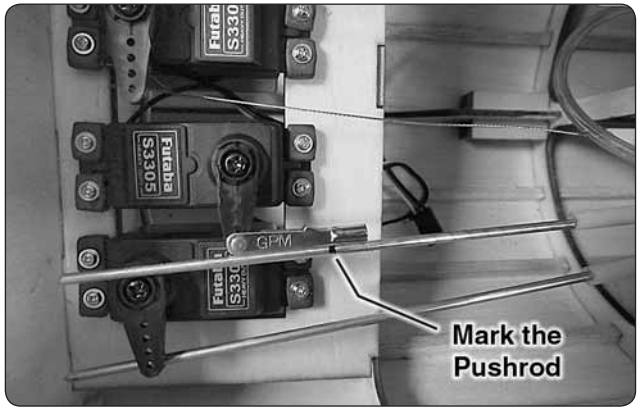
With its low-wing cantilever monoplane layout, retractable, wide-set landing gear and enclosed cockpit, the Zero was one of the most modern aircraft in the world at the time of its introduction. It had a fairly high-lift, low-speed wing with a very low wing loading. This, combined with its light weight, resulted in a very low stalling speed of well below 110 km/h; (69 mph). This was the main reason for its phenomenal maneuverability, allowing it to out-turn any Allied fighter of the time.

INSTALL THE ELEVATOR & RUDDER SERVOS

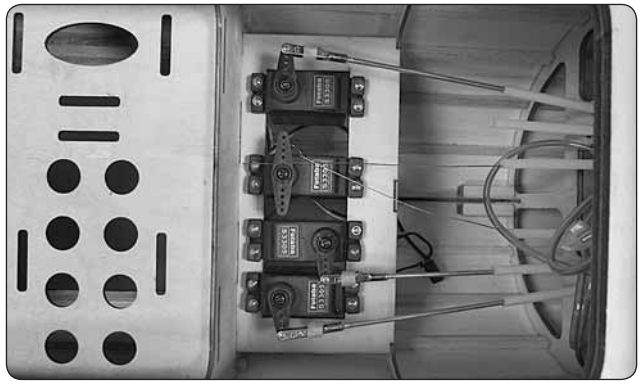


❏ 1. Place two elevator, one rudder and one tail wheel steering servo in the servo tray as shown.

Make three, one-arm servo arms from the servo arms that came with your servos and one two arm servo arm. Position the servo arms as shown. Position the servos so the pushrod wires align with the outer hole in the servo arm. Drill a 1/16" [1.6mm] hole through each of the mounting holes in the servos. Secure the servos to the servo tray with the screws that came with the servos.



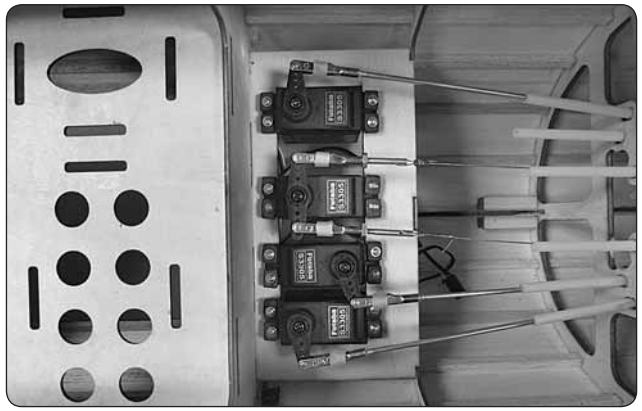
❏ 2. Center the servo arms and then install solder clevises on the elevator and rudder servo arms in the outer hole from the center of the servo arm. Following the same procedure that was done for the aileron and flap pushrods, center the control surfaces and mark the elevator pushrods where they are to be cut for the solder clevises. Cut the wire on the mark.



❏ 3. Solder a clevis to each of the pushrod wires with high quality silver solder. If you are unfamiliar with how to solder a clevis use the "Hot Tip" that follows. Once soldered install a silicone clevis keeper over the clevis and install the clevis in the outer hole in the servo arms.

If you are not familiar with soldering follow the "Hot Tip" on page 9.

❏ 4. Locate two threaded brass couplers and install a 4-40 nut and threaded 4-40 clevis and silicone clevis keeper as shown.



❏ 5. Center the servo arm for the tail wheel steering servo. Install one of the clevis assemblies you just put together into the outer hole in the servo arm. Install a swage on each of the two rudder cables, securing it following the same procedure used on the tail gear. Use pliers to crimp the swage tightly on the cable. Attach each clevis to the outer hole of the servo arm.

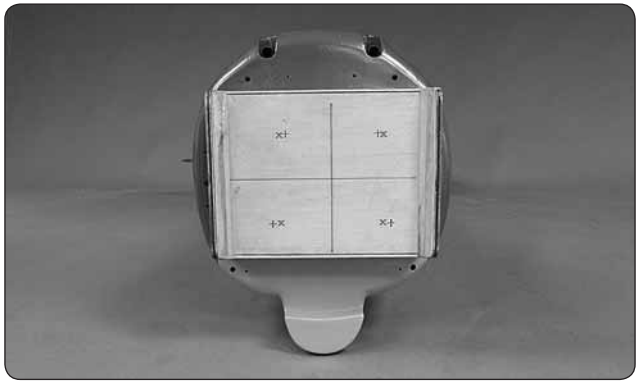
❏ 6. Adjust the tension of the wires and then lock the nut against the clevis. Be sure to apply a drop of threadlocker to the nut.

Did You Know?

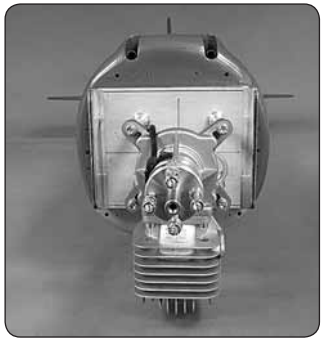
During the final years of the War in the Pacific, the Zero was used in kamikaze operations. In the course of the war, more Zeros were built than any other Japanese aircraft.

INSTALL THE ENGINE, THROTTLE/CHOKE SERVOS AND IGNITION SWITCH

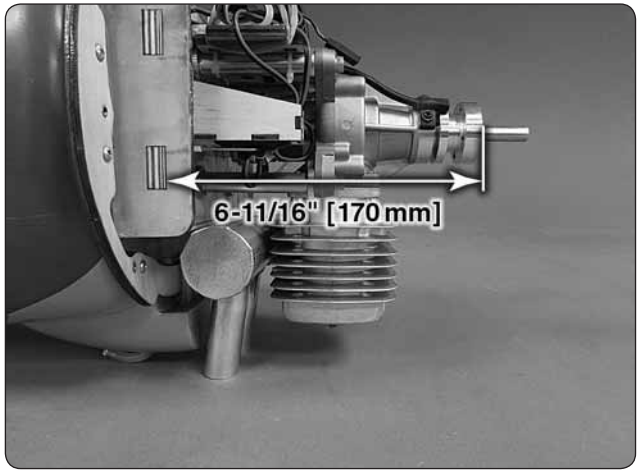
The following engine mounting instructions shows the installation of the DLE55 side exhaust gas engine. The installation of other brands of engines will be similar and the following instructions can be used as a guide.



❏ 1. The firewall has two sets of engine mounting bolt patterns embossed on it. The "x" is for the DLE 55 side exhaust gas engine. The "+" is for the DLE rear exhaust engine. In the back of this manual we provided a paper template for mounting the OS GT 60 gas engine. If you are installing an engine with a different mounting bolt pattern the firewall has crosshairs embossed on it to help locate the correct mounting location. Drill a 3/16" [4.8mm] hole through the firewall at each location marked with a "x".

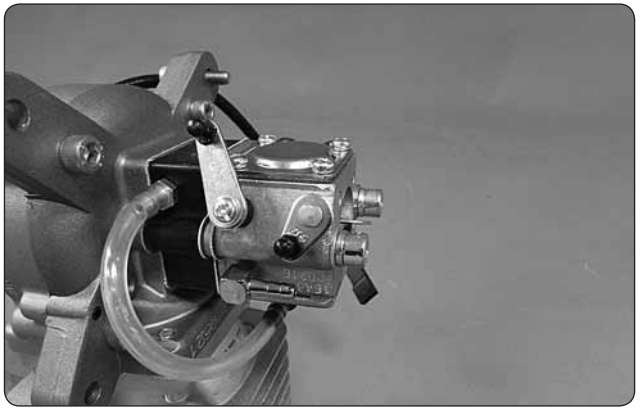


❏ 2. Install engine mounting bolts, flat washers and lock washers from the back of the firewall. (The mounting hardware is not included in this kit, it should come with the engine. If your engine did not include fender washers, purchase four fender washers to mount the bolts from behind the firewall. The fender washer helps to better spread the load from the engine). Apply a drop of thread locker to each bolt before installing them into the engine stand-offs. The stand-offs can be permanently mounted. The bolts mounting the engine to the stand-offs should not be permanently installed as they will be removed several times during the process of installing the engine.

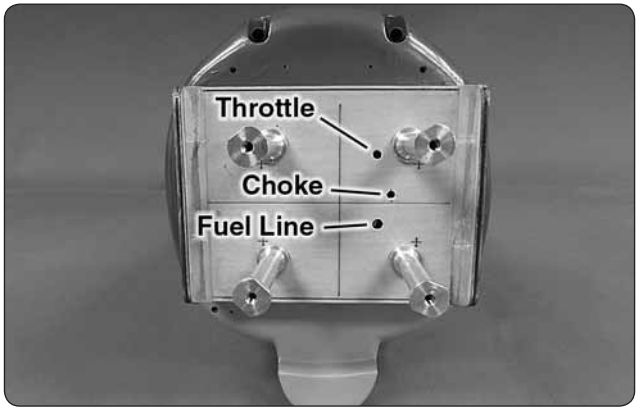


❏ 3. For reference, the distance from the front of the firewall to the front of the drive washer is 6-11/16" [170 mm]. *(Please note that this photo shows items on the engine that you will be installing in future steps.).*

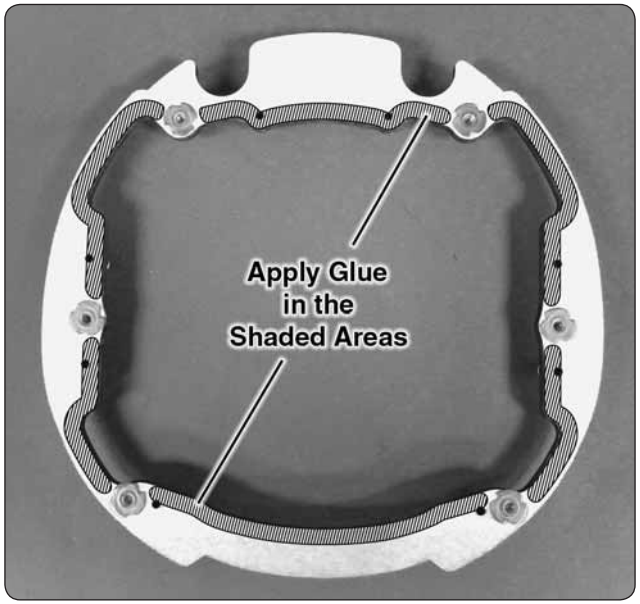
Many modelers have their own opinions for connectors and throttle linkage. We have provided materials for a secure and safe throttle linkage. We have also included a method to connect a linkage to the choke. This will require the use of an additional servo for the choke linkage. Some modelers may prefer a mechanical choke linkage. Review the following procedure and then modify it as you wish to fit your personal preferences.



❏ 4. Install a 2-56 ball link and 2-56 nuts to both the throttle and the choke. Be sure to apply a drop of thread locker to the threads on the ball link.

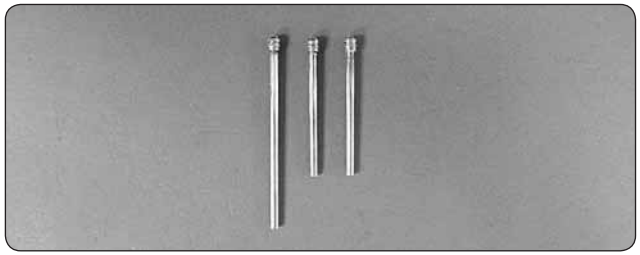


❏ 5. Make marks on the firewall where the throttle, choke and fuel line will pass through. Remove the engine from the stand-offs then drill a 3/16" [4.8mm] hole through the firewall for the throttle and choke. Drill a 1/4" [6.4mm] hole on the mark for the fuel line. (Check the diameter of your fuel line to be sure that a 1/4" [6.4mm] hole is correct).

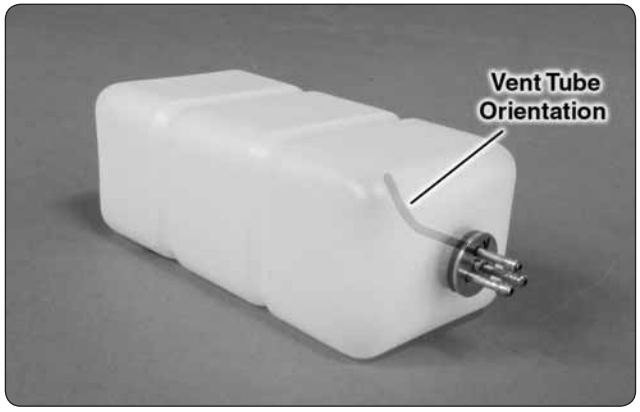


❏ 6. Apply epoxy to the back of the plywood ring as shown. Do not apply any glue near the blind nuts. You do not want get any glue into the threads of the blind nuts.

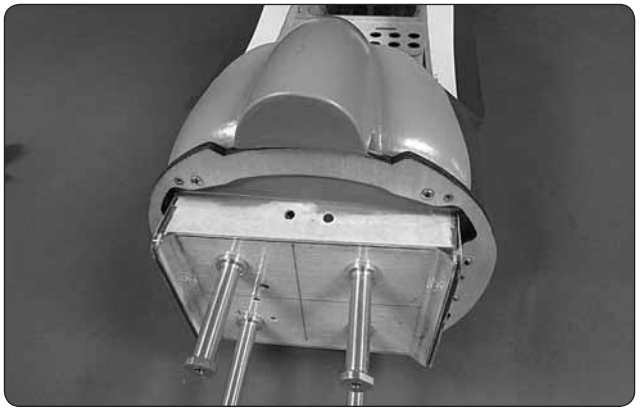
❏ 7. Install the ring to the front of the fuselage with eight #6 x ½" [13mm] screws. The holes for these screws are pre-drilled in the front of the fuselage. Be sure the screws go into these holes to assure that the ring is positioned properly on the front of the fuselage. If any glue runs out of the ring onto the fuselage, clean it with a paper towel and alcohol.



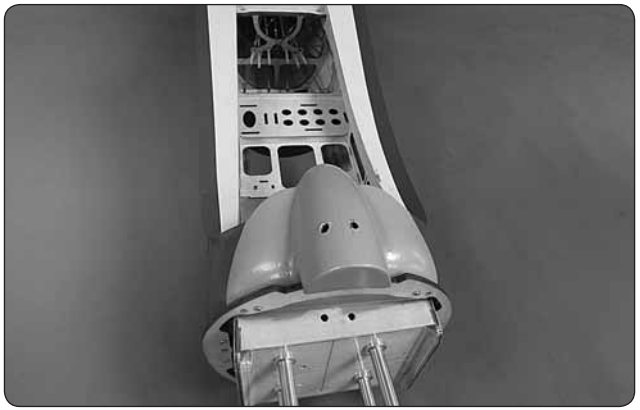
❏ 8. Assemble the fuel tank stopper assembly with the fuel tubes as shown. The easiest way is to first solder a fuel line barb (not included) onto one end of all three tubes. We used the 5/32" Dubro Fuel Line Barbs (DUBQ0672). Insert the tubes into the stopper with the metal plates, and then solder a barb onto the other end of the two short tubes. Bend the vent tube and connect the pickup and fueling/defueling lines (not included) to the short tubes. Connect the clunks to the Tygon Fuel lines (not included) and secure the lines to the clunk and brass tubing with the included small tie straps.

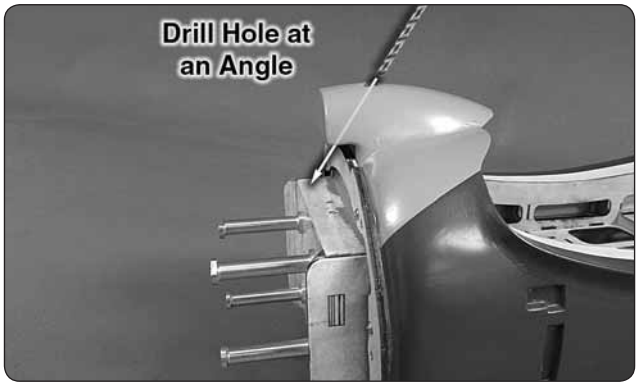


❏ 9. Install the fuel tank stopper assembly in the fuel tank. Check that the clunks move around freely in the fuel tank. Tighten the fuel tank stopper screw.



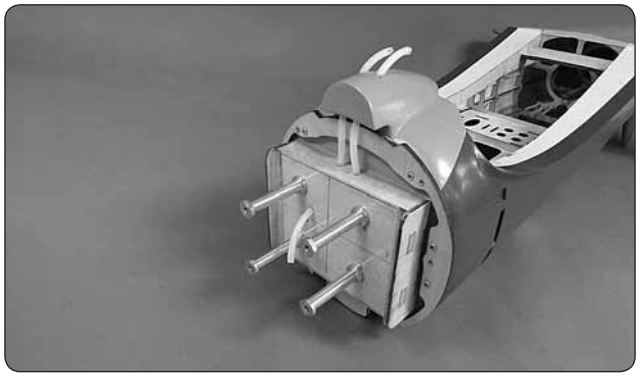
❏ 10. Drill two ¼" [6mm] holes in the bottom of the firewall box as shown. These holes will be used to route the fuel lines.



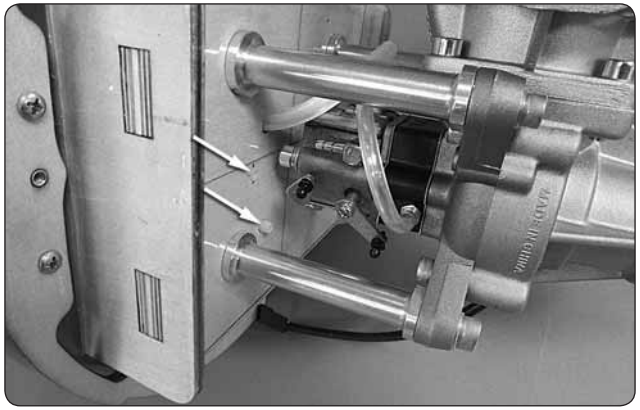


❏ 11. Drill two ¼" [6mm] holes in the bottom of the air scoop as shown. The holes should be drilled at an angle and through the top of the air scoop.

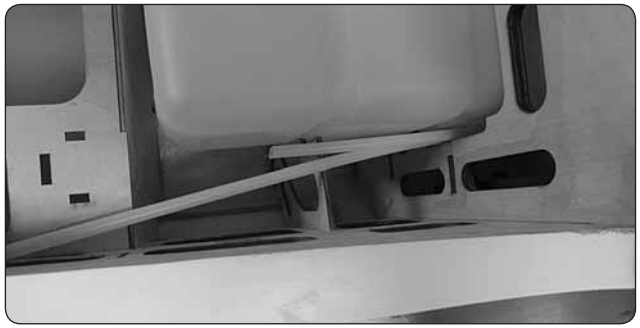
❏ 12. Install fuel lines onto the brass tubes from the fuel tank. To route the fuel lines as will be shown here you will need to use a 24" [610mm] length of tubing on the fill and vent lines and a 6" [152mm] length on the carburetor line.



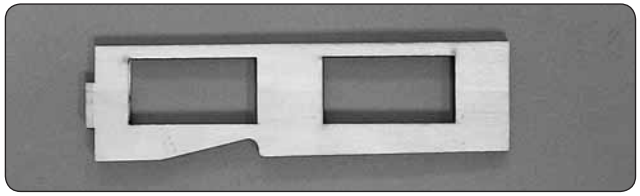
❏ 13. With the fuel lines installed on the fuel tank, install the lines and tank into the fuselage. Make sure the vent tube in the tank points toward the top of the fuselage. Feed the lines into the holes you drilled. You will find it easier to route the fuel lines if you install a long handled ball wrench through the holes and slide the fuel line onto the wrench. This way you can use the wrench as a guide for feeding the lines through. Install the metal fuel plug into the fuel line that is the fill line.

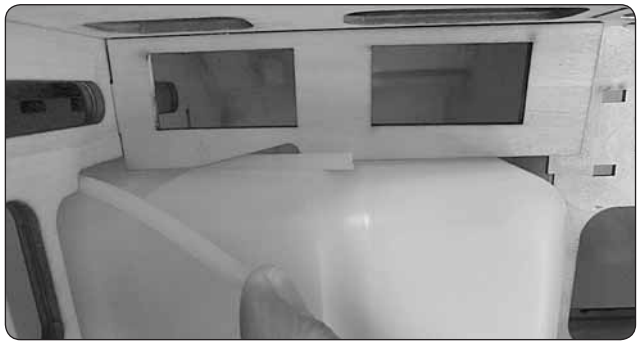


❏ 14. Locate the 24" [610mm] plastic outer pushrod tube. Cut two pieces 6" [152mm] in length. Roughen the end of each tube with 120 grit sandpaper. Test fit the tubes into the fuselage. Slide the tubes into the firewall so the roughened end of the tube contacts the firewall.



❏ 15. When the tubes are inserted into the fuselage they should pass through the opening next to the fuel tank.



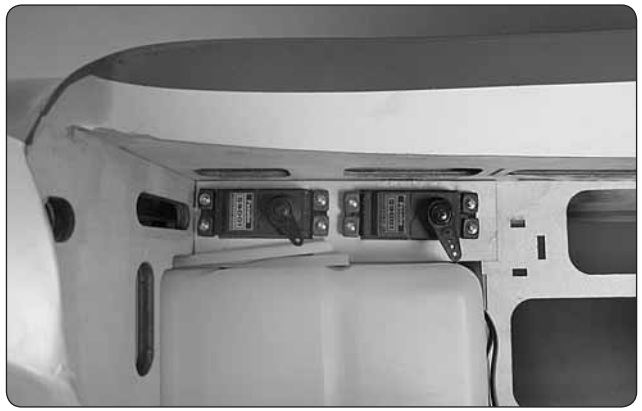


❏ 16. Test fit one of the two plywood servo trays alongside the fuselage. The tab in the tray notches into the slot in the former. Notice that the tube for the

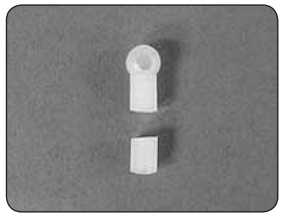
throttle servo fits through the notch in the tray. Now that you have an understanding of how all of the parts fit together, remove the tray and the pushrod tubes.

❏ 17. Apply a small amount of epoxy to the roughened end of each of the two tubes. Re-install the tubes back into the holes in the front of the fuselage. The tubes should be flush with the firewall. Allow the glue to cure.

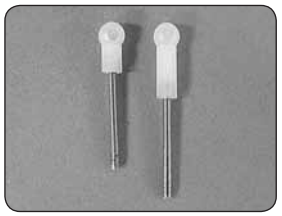
❏ 18. Once the glue holding the tubes has hardened glue the plywood servo tray in place. Be sure that the notch is securely glued to the former and that the plastic throttle tube passes through the notch in the plywood servo tray. If necessary, refer to the pictures in step 16 as a reference for the installation.



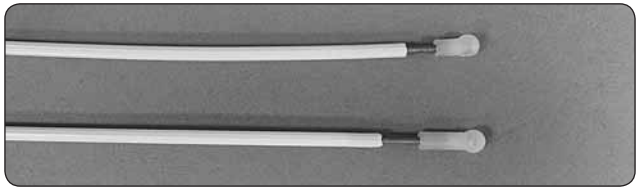
❏ 19. Install the servos into the servo tray. Notice the orientation of the servo arms and be sure your servos are installed as shown. The choke servo (the servo closest to the front of the fuselage) should have a short servo arm installed. The throttle servo should have the long servo arm installed. Drill a 1/16" [1.6mm] hole through each of the servo mounting holes. Secure the servos with the screws that came with your servos.



❏ 20. Locate one of the nylon ball links. Use a hobby knife and cut the ball link in half. The lower portion of the ball link can be discarded.

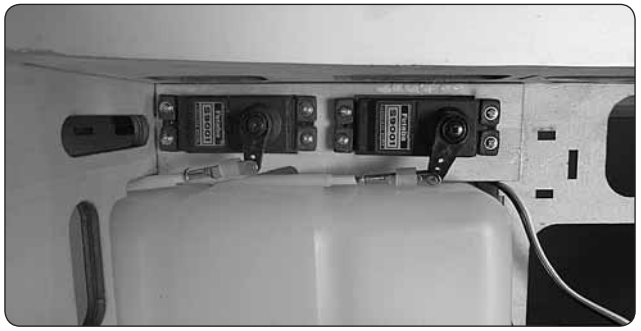


❏ 21. Install a 2-56 x 1" [25mm] threaded rod into the nylon ball link you cut as well as one additional nylon ball link.

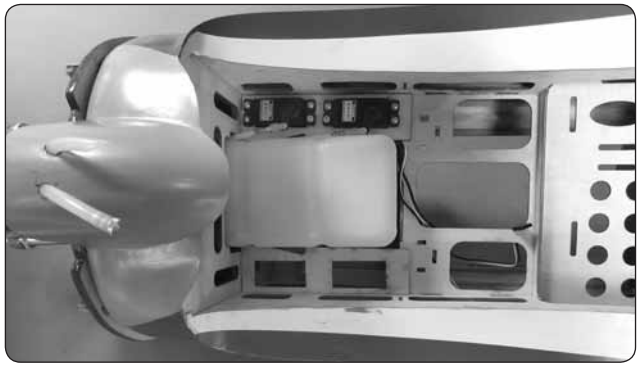


❏ 22. Locate the 24" [610mm] inner pushrod tube. Cut off a 6" and a 10" length of the tube. Screw the two ball links to the two tubes you just cut.

❏ 23. Assemble a 2-56 clevis, 2-56 nut, clevis keeper and 2-56 x 1" threaded rod as shown. Assemble two of these.



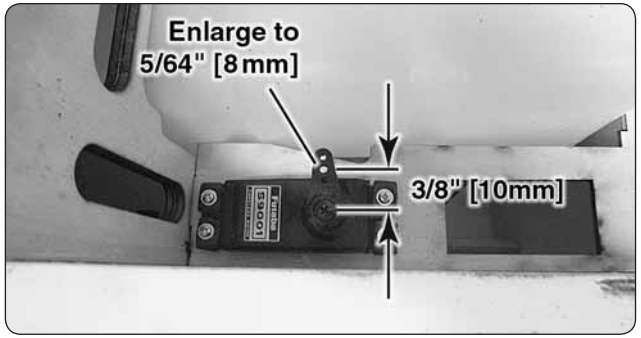
❏ 24. Push the throttle arm and choke arm on the engine forward. Install each of the clevises into the outer hole in the servo arms and rotate the arms forward to the position that would approximate the position of the servo arm when it is pushing forward the throttle and choke. With the clevises in place, use the clevis as a reference for cutting the throttle and choke tubes to the correct length. Mark the tubes where they should be cut and the cut them to the proper length. Install a clevis assembly into both the throttle and choke pushrods.



❏ 25. Install the remaining plywood servo tray on the other side of the fuel tank. Glue it in place the same way you did for the throttle / choke servo tray.

DECISION YOU MUST MAKE

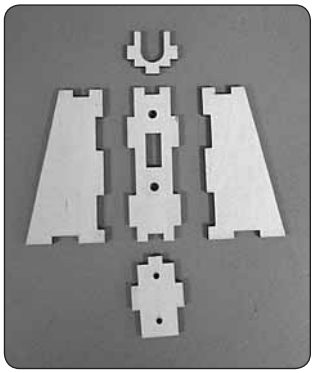
At this point you have to make a decision as to how you are going to install the ignition switch. A commonly accepted method is to simply mount the switch near the front of the fuselage, keeping it close to the engine. Because the front of the fuselage is fiberglass as well as the way the fuselage is constructed there is not a convenient spot to mount the ignition switch. The next few steps show our method for mounting the switch on the firewall. This will require the use of an additional servo since the switch will be servo activated. If you wish to use our method, continue with the construction. If you would like to mount the switch elsewhere, skip ahead to step 37.

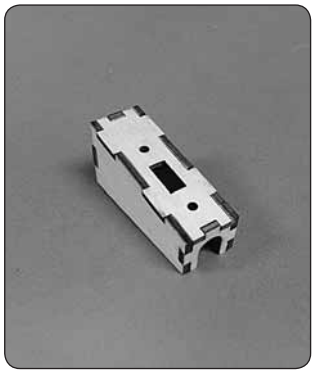


❏ 26. Install a servo into the forward hole in the servo tray as shown. Drill a 1/16" [1.6mm] hole through each of the servo mounting holes. Secure the servo with the mounting screws that came with the servo. When

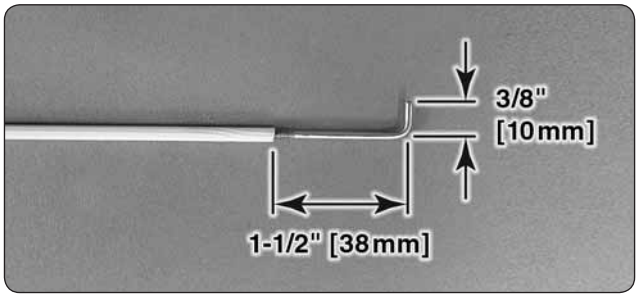
choosing the servo arm, use the shortest arm available. Drill out the hole closest to 3/8" [10mm] from the center of the servo with a 5/64" [8mm] bit.

❏ 27. A hole needs to be drilled in the firewall for the pushrod from the servo you just mounted. Look at the location of the servo. Determine where the pushrod will come through the firewall and mark the location on the firewall. When you are satisfied with the location for the hole, drill a 9/64" [3mm] hole on the mark.

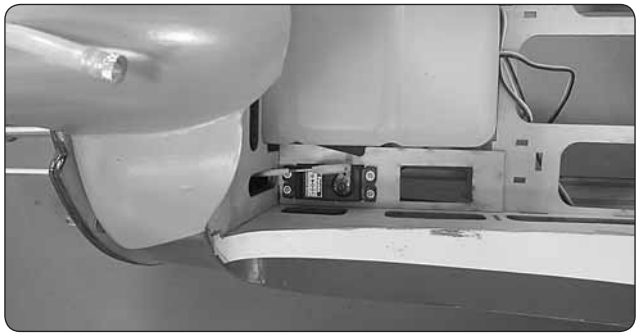




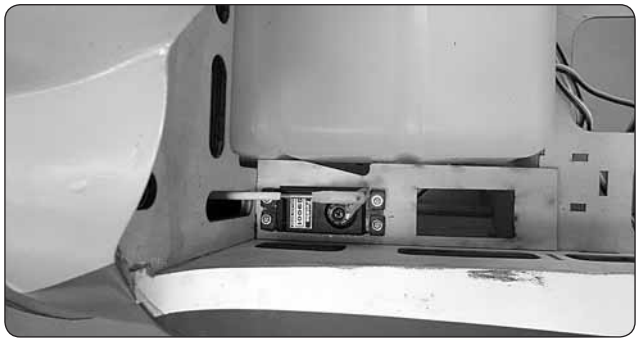
❏ 28. Locate the plywood parts for the ignition switch. Glue it together as shown.



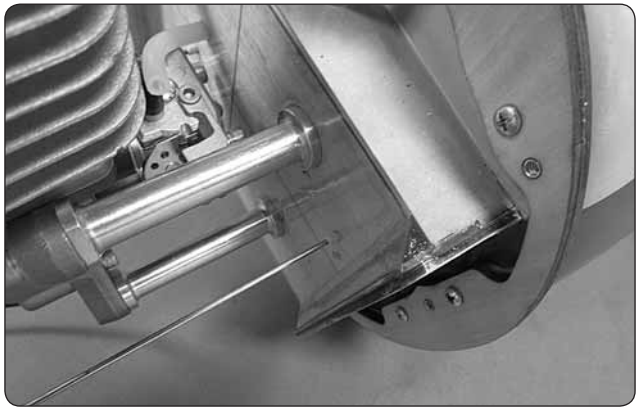
❏ 29. From the remainder of the 24" [610mm] plastic inner plastic tube cut a 5" [127mm] length. Screw a 2-56 x 4" [102mm] pushrod wire into one end of the tube. Bend it as shown and cut off the excess wire.



❏ 30. Install the pushrod through the firewall. Install the metal pushrod into the hole you drilled in the servo arm. Secure it with a nylon clevis keeper.

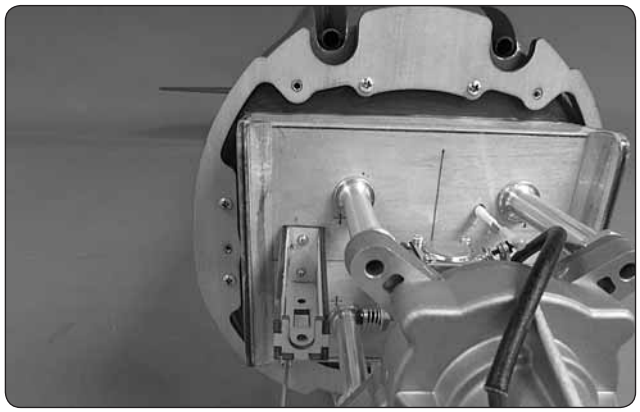


❏ 31. Rotate the servo arm back to a position that would be where the servo arm would rest when the servo is pulling back.

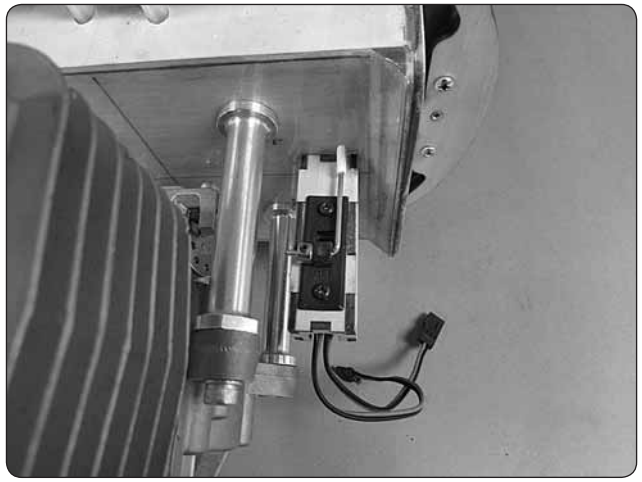


❏ 32. Cut the plastic tube a ¼" [6mm] in front of the firewall. Thread another 2-56 x 4" [102mm] pushrod wire into the tube.

❏ 33. Install a large battery switch harness into the plywood switch mount. Place the switch and mount against the firewall, aligning the hole in the switch with the pushrod wire. Use a pencil and make a mark on the firewall for one of the mounting holes.



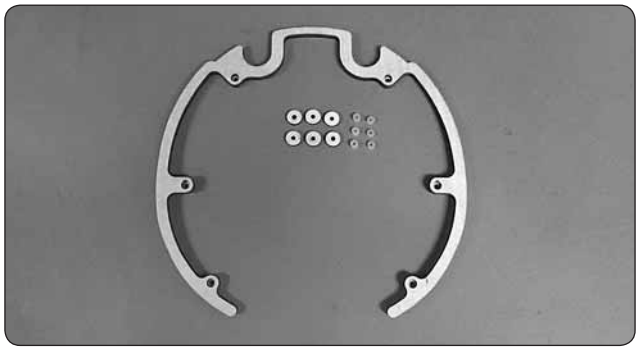
❏ 34. Remove the switch from the switch mount. Place the switch mount on the mark you made. Drill a 1/16" [1.6mm] hole through each of the mounting holes in the switch mount. Mount the switch to the firewall by gluing it in place and securing it to the firewall with two #2 x 3/8" [10mm] screws and #2 flat washer.



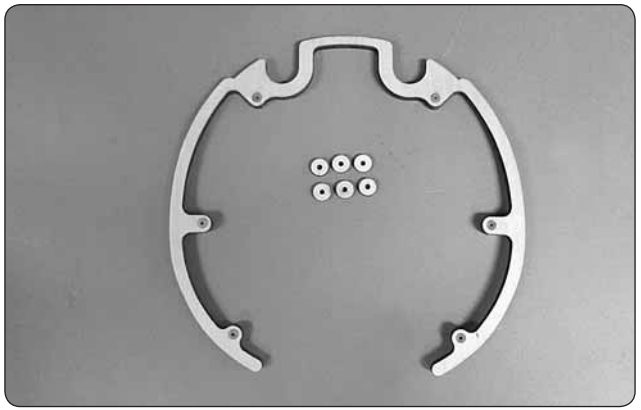
❏ 35. Re-install the switch back into the mount. Push the switch towards the firewall. Make a mark on the wire where it aligns with the hole in the switch. Bend the wire on the mark. Cut off the excess wire and push the wire through the hole in the switch. Secure the wire to the switch with a 3/32" [2.5mm] wheel collar and a 4-40 set screw.

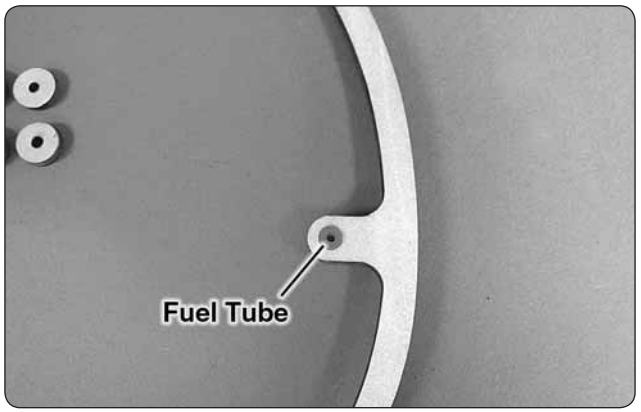
❏ 36. Locate the plywood fuel tank former. Secure it behind the tank with two #2 x 3/8" [10mm] screws and #2 flat washers.

INSTALL THE COWL



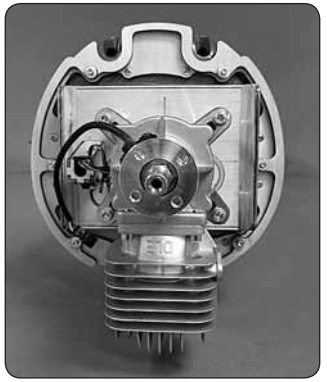
❏ 1. Locate the cowl mounting ring, six 1/8 plywood rings and three of the ¼" [6mm] silicone fuel tube pieces. Cut them in half leaving you with six 1/8" [3mm] lengths.



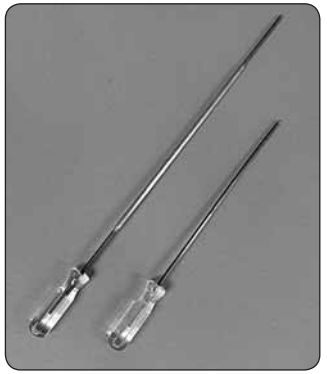


❏ 2. Insert the fuel tube into the holes in the cowl mounting ring.

❏ 3. Install a 6-32 x 3/4" [19mm] socket head cap screw and #6 flat washer into one of the plywood discs. Thread the screw into the silicone. Apply CA glue to the back of the plywood disc. Using the screw as your centering guide, slide the disc onto the mounting ring. Do this for all six mounting screws. Don't get CA on the screw threads.



❏ 4. Install the cowl mounting ring to the ring on the firewall.



❏ 5. To access the cowl mounting bolts you are going to need a 7/64" long handled allen wrench to access the cowl mounting bolts through the front of the cowl. You will need a wrench 10" [254] long. These can be difficult to find. An easier way is to take a 7/64" allen wrench, cut it in half and then using silver solder, solder a length of 1/8" [3mm] brass tube between the two halves of the wrench.

❏ 6. With the engine mounted to the front of the firewall slide the cowl onto the front of the fuselage. Work slowly and mark where the cowl needs to be cut to allow it to fit completely over the engine.

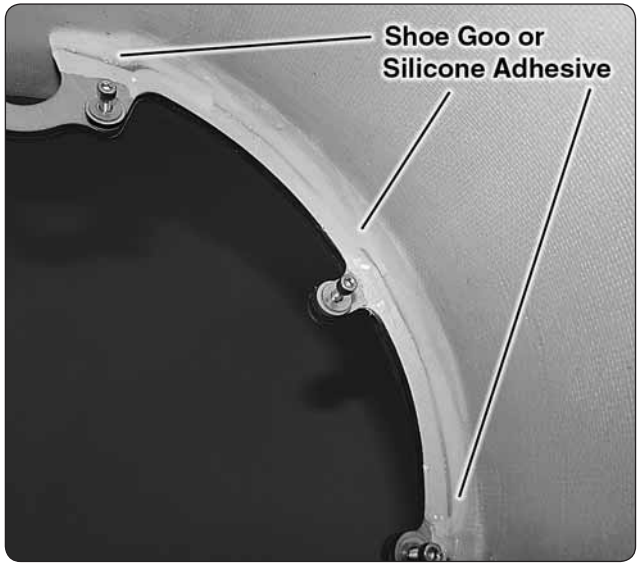
❏ 7. When you have trimmed the cowl and are able to slide the cowl over the cowl ring, use a pencil to mark the inside of the cowl where the cowl ring contacts the cowl. Lightly sand the inside of the cowl with 220-grit sandpaper on the line. After sanding wipe the area clean with a paper towel and alcohol.

❏ 8. Place the cowl over the engine onto the cowl mounting ring. Adjust the position of the cowl, making sure it is centered on the engine. Make sure when positioning the cowl that the molded machine gun ports on the top of the cowl are aligned with the guns in the fuselage.

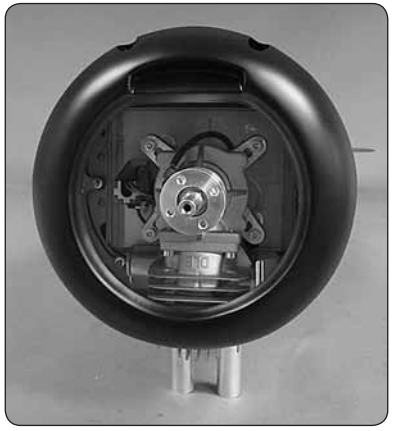
❏ 9. Once you have it positioned slide the spinner back plate over the prop shaft. With the spinner back plate in position double check the centering of the cowl with the back plate. When you are satisfied with the position of the cowl, remove the spinner back plate.

❏ 10. Mix 5-minute epoxy with some micro balloons. Using a long stick (not included) apply small amounts of epoxy to tack glue the cowl to the cowl mounting ring. Leave the cowl undisturbed until the glue hardens.

❏ 11. When the glue hardens remove the cowl. If you haven't yet figured out why you put silicone tubing in the cowl mounting ring it will become evident when removing the cowl. When you unscrew the mounting screws you can see how the screws are retained in the cowl mounting ring. When re-installing the cowl you can see that the screws work as mounting pins to align the cowl to the fuselage. You also have the added benefit that the screws are already positioned so you don't have to try and balance the screw on the wrench while finding the mounting holes. You will be able to access the mounting screws from the front of the cowl as well as the holes for the machine guns in the top of the cowl. TIP: If you take each of the mounting bolts out of the ring and file them to a point on a grinder or belt sander, the bolts will find the blind nuts easier when locating the cowl.

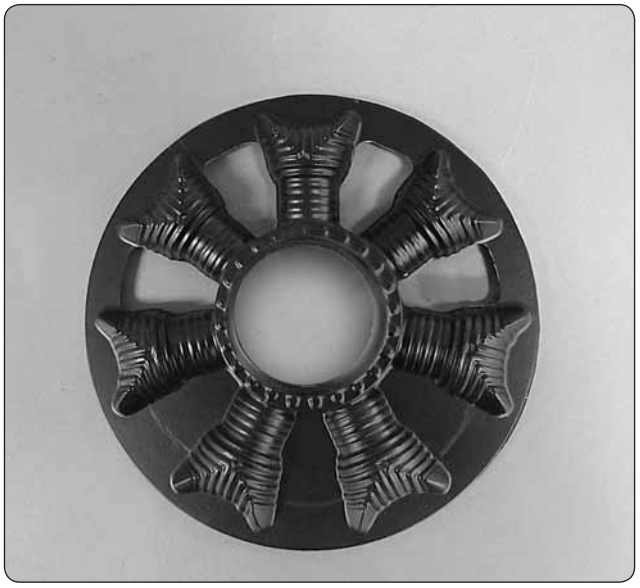


❏ 12. Apply shoe goo or silicone adhesive to the front of the cowl ring, permanently mounting the cowl ring to the cowl. Do not disturb the cowl while waiting for the glue to harden.



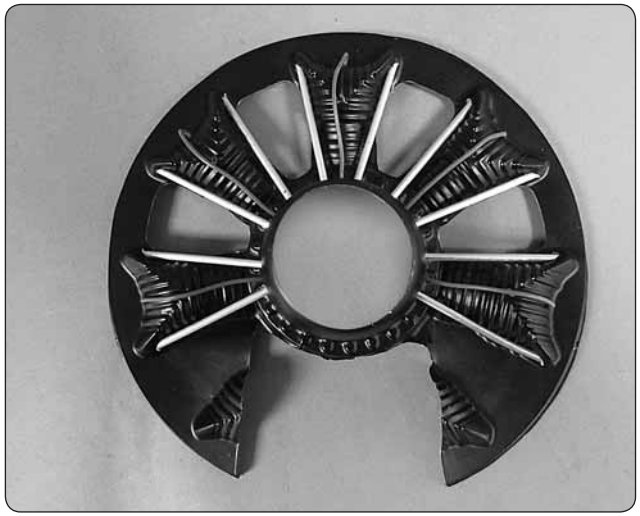
❏ 13. Install the muffler onto the engine and then re-install the cowl over the engine. Make any additional adjustments to the opening in the cowl to accommodate the muffler.

❏ 14. Using a high speed rotary tool remove the center from the dummy engine.

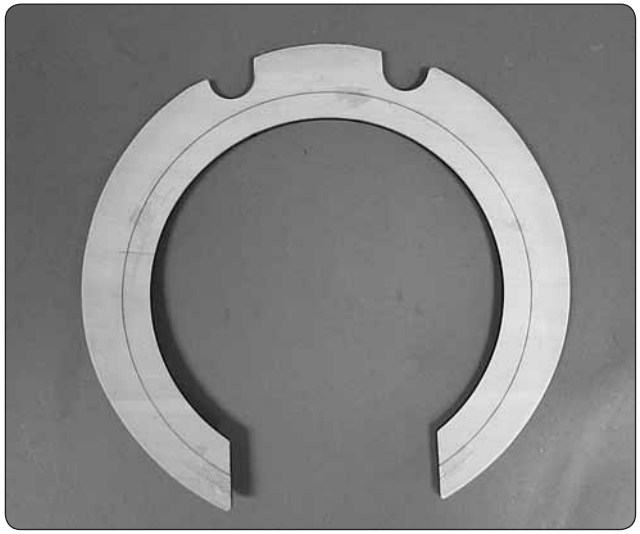


❏ 15. Carefully cut out the area between the cylinders as shown. Only cut openings in the top half of the dummy engine.

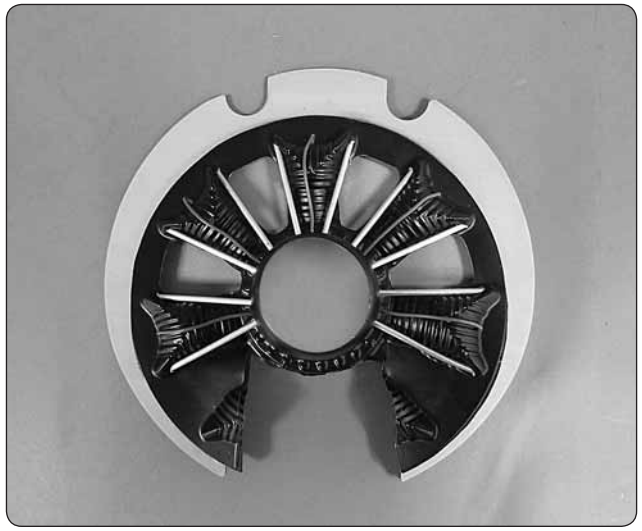
❏ 16. Place the dummy engine in front of the engine. Using the engine as your guide, make reference marks on the dummy engine where the engine cylinder head is and cut away that area from the dummy engine.



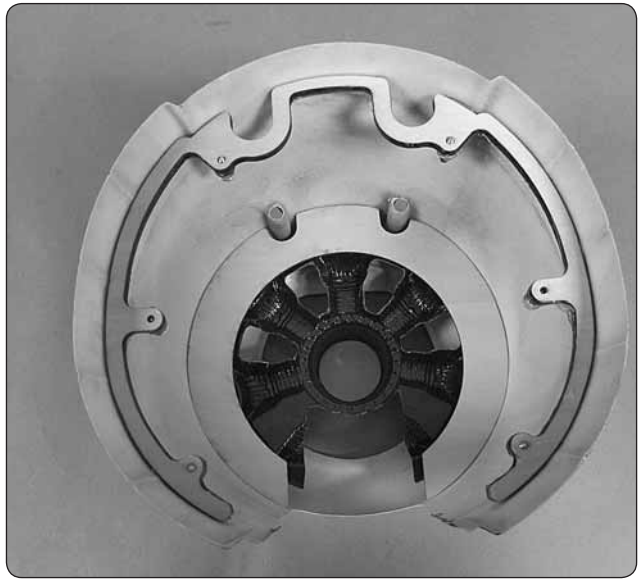
❏ 17. Drill 1/8" [3mm] holes in the dummy engine for the pushrod tubes. Slide the aluminum tubes into the holes. Drill a 1/16" [1.6mm] hole in the top of each cylinder and at the base of the cylinder. Install a red wire into each of the cylinders, cutting each wire from the 18" [450mm] length wire. Apply Shoe Goo or silicone glue to each of the tubes and wires on the back side of the dummy engine to secure them in place.



❏ 18. The plywood plate shown is the baffle to secure the dummy engine to the cowl.



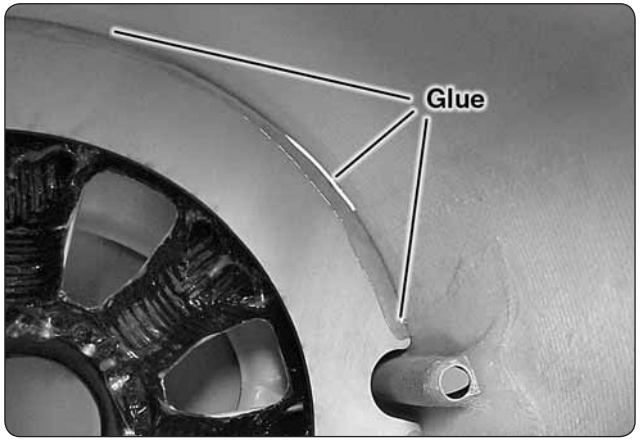
The line laser etched into the front of the plywood plate is a reference mark for gluing the dummy engine to the baffle



❏ 19. Place the dummy engine inside of the cowl followed by the plywood baffle. Press the baffle in place until it fits snug in the front of the cowl. Attach the cowl to the firewall, center the dummy engine with the prop shaft and position the dummy engine against the baffle.

Check to make sure the dummy engine is located just behind the drive washer and does not extend in front of the engine drive washer. In order to get a proper fit you may need to sand the edge of the baffle slightly to get it far enough into the cowl.

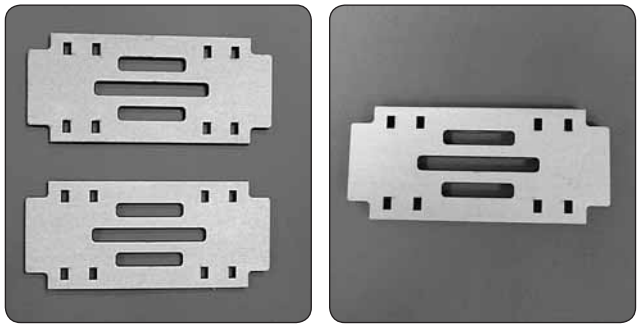
❏ 20. When you are satisfied with the position of the baffle, tack glue it in place in the cowl. Re-install the cowl to the fuselage. Once again, hold the dummy engine in place against the plywood baffle, centered on the prop shaft and be sure the dummy engine is behind the drive washer of the engine. If everything still appears to be properly positioned, remove the cowl from the fuselage.



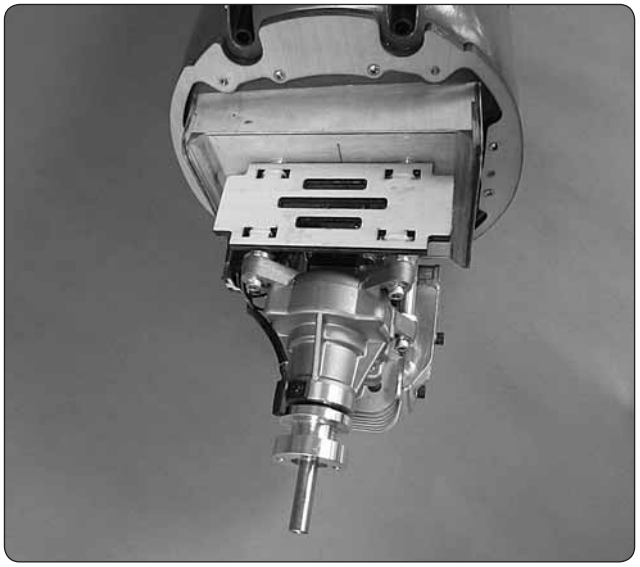
❏ 21. Apply a bead of Shoe Goo or silicone glue to the back of the plywood baffle, securing it to the cowl. Once the glue has cured remove the cowl.

❏ 22. Re-install the cowl to the fuselage. Center the dummy engine with the engine, positioning the dummy engine as shown. Check to be sure you will have access to all of the mounting bolts when the dummy engine is in its proper location. If needed use a high speed rotary tool to cut any additional access holes for the mounting bolts. When you are satisfied, tack glue the dummy engine to the plywood baffle with a few drops of CA glue to keep it in place on the baffle.

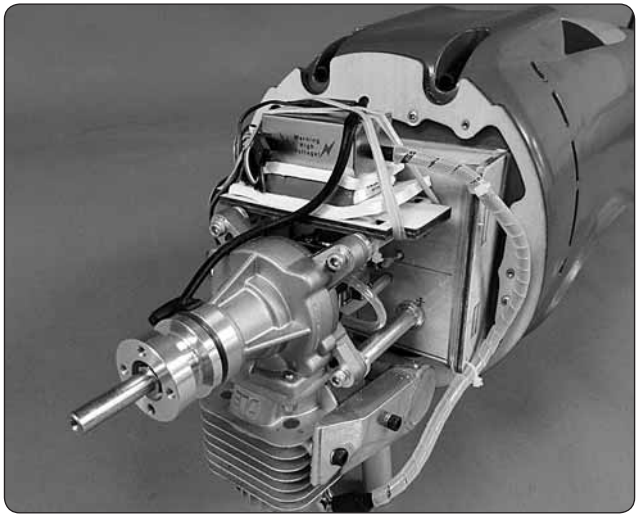
❏ 23. Remove the cowl. Permanently secure the dummy engine to the plywood disk by applying Shoe Goo or silicone glue in the cavity on the backside of the dummy engine and the plywood baffle. Allow the glue to cure.



❏ 24. Locate two 1/16" [1.6 mm] plywood ignition module trays. Glue the two trays together.



❏ 25. Install the tray onto the top of the engine stand-offs. Secure the tray with two tie wraps through each of the mounting holes.



❏ 26. Place a piece of foam on the tray, your ignition battery, another layer of foam and the ignition module. Secure it all in place with #63 rubber bands included in the kit. Make all of the connections between the battery, switch and ignition module. Secure all of the connections with heat shrink tubing, tape or some other method to secure the connections.

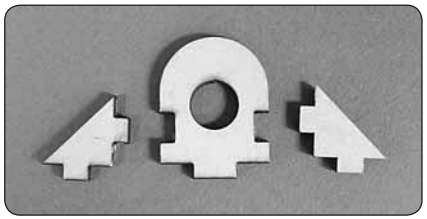
❏ 27. Install the plastic insulation onto the ignition lead. Secure the lead so it does not contact the muffler. We did this by drilling a couple of holes in the firewall box and securing the lead with tie wraps.

❏ 28. We decided to shorten the exhaust pipes by approximately 1" [25 mm]. If you decide to do this, now would be a good time to cut the pipes.

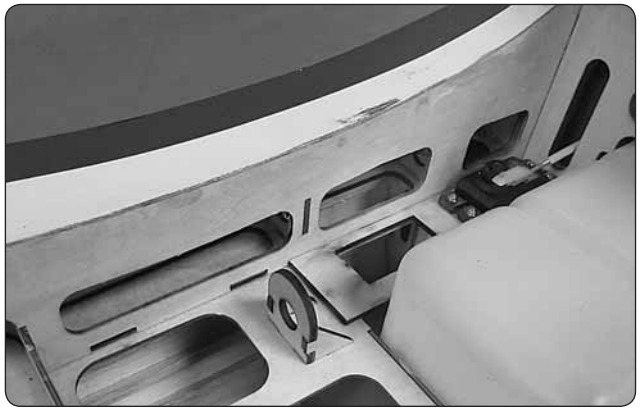
❏ 29. You have had the engine off and on the mounts several times. Remove each of the mounting bolts and apply a drop of thread locker to each bolt and tighten all of the mounting bolts as well as the muffler bolts.

❏ 30. Re-install the cowl. As you begin installing it over the engine you will probably need to make some additional clearance for the spark plug lead. Make any additional clearance cuts as needed for the cowl to fit over the engine.

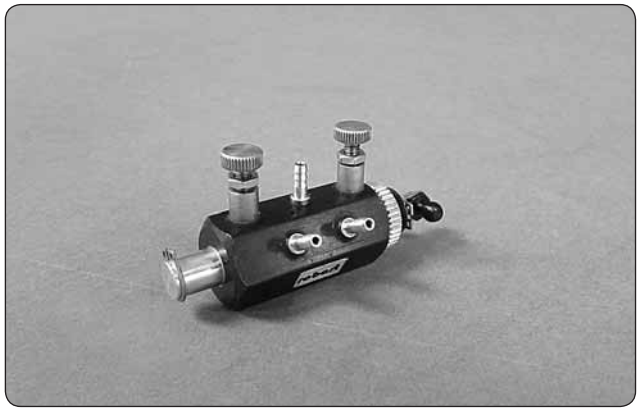
COMPLETE THE INSTALLATION OF THE RADIO SYSTEM, AIR VALVE AND AIR TANK



❏ 1. Locate the air valve plywood former parts shown and glue the three pieces together.



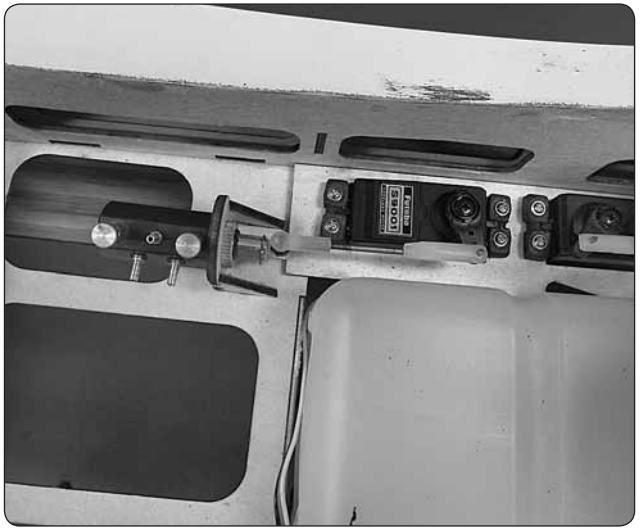
❏ 2. Glue the former into the slots in the fuselage.



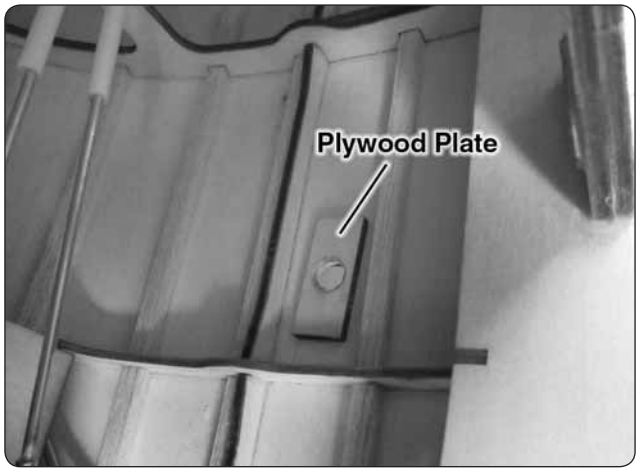
❏ 3. Secure a 0-80 ball link and 0-80 nut to the hole in the end of the air valve arm.

❏ 4. Install the air valve into the former as shown.

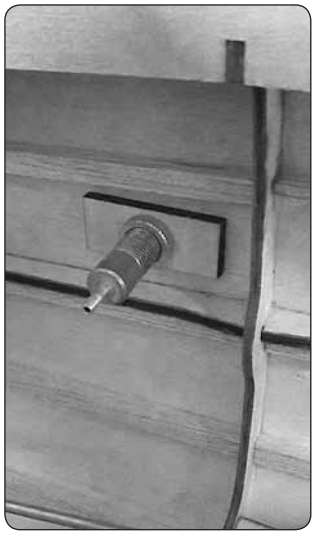
❏ 5. Install the air valve servo using the hardware that came with the servo. Enlarge the outer hole of a short servo arm with a 5/64" [2mm] drill.



❏ 6. Install a plastic ball link onto the threaded end of a 2-56 x 6" [152mm] pushrod wire. Put the ball link on the ball. Pull the air valve cylinder towards the front of the fuselage. Position the servo arm slightly towards the front of the fuselage. Make a mark on the wire where it aligns over the hole enlarged in the servo arm. Bend the wire on that mark. Cut the wire 3/8" [10mm] above the bend in the wire. Install the wire in the hole you drilled in the servo arm and secure it to the servo with a nylon Faslink.



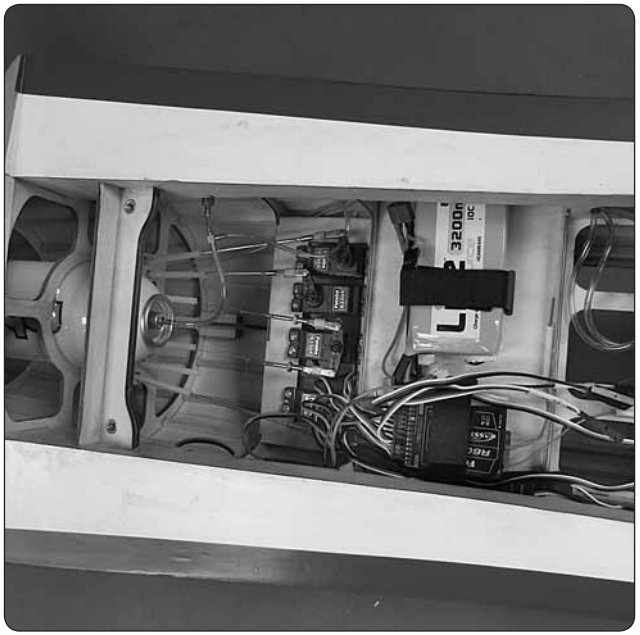
❏ 7. Enclosed with the kit is the 1/8" [3mm] plywood plate you see in this photo. This is a backing plate for the air fill valve. Choose a location you wish to mount your fill valve. We chose the fuselage side. Glue the plywood plate to the fuselage. Open the hole through the plate and into fuselage side for the fill valve.



❏ 8. Install the air fill valve into the former extending outside of the fuselage.

❏ 9. Connect the air lines to the air valve, fill valve and air tank following the instructions that came with the retract system. Secure the air tank into the former in the back of the fuselage with Shoe Goo or silicone glue. Leave the fuselage undisturbed until the glue cures.

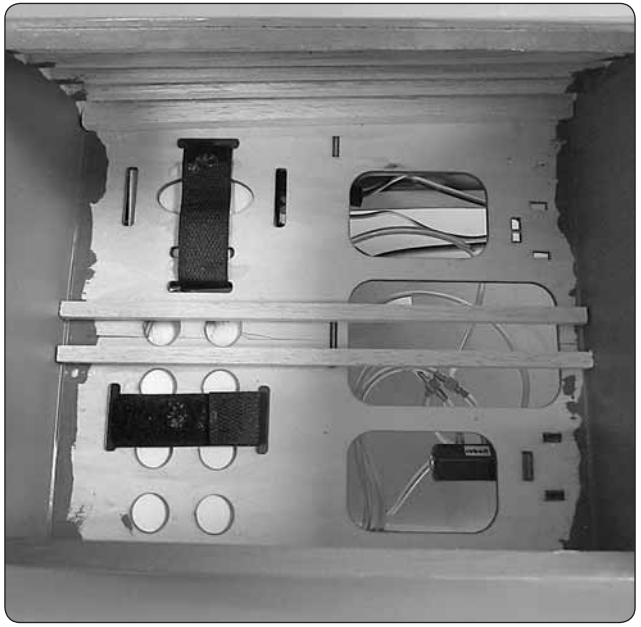
❏ 10. Install the radio switch and charge jack to the side of the fuselage.



❏ 11. Install the foam under the receiver and the receiver battery and place them onto the tray as shown. Cut the included hook and loop material to the proper length and secure the battery and receiver with the hook and loop straps. Connect the servos to the receiver and route your receiver antenna following the instructions with the radio system.

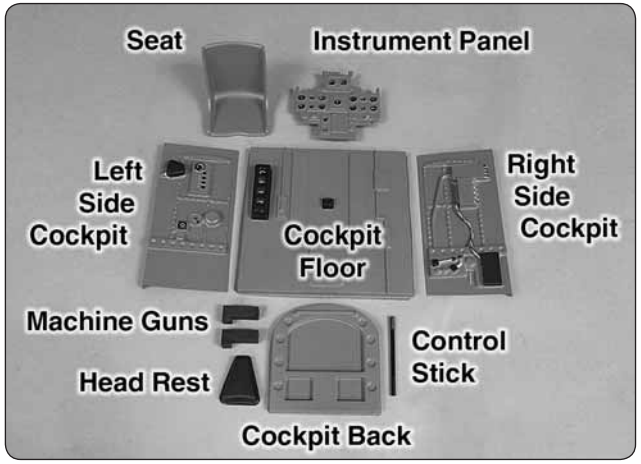
INSTALL THE COCKPIT, PILOT AND CANOPY

We have provided a cockpit interior that, on its own, gives a very realistic look to the interior of the aircraft. With a little time and creative use of additional materials you can make a very detailed interior. Look through the following instructions to gain a better understanding of how the cockpit goes together. The installation shown here is for the basic cockpit interior. If you are going to add additional detail you may wish to make those additions before you assemble the interior. Added details can be created more easily when the cockpit is not installed into the aircraft.



❏ 1. Locate the cockpit floor and spacer sticks. Cut the sticks as needed to fit the cockpit and glue them in place as shown. These sticks are simply spacers to raise the cockpit floor to allow clearance for the hook and loop straps holding the battery and receiver. Once the cockpit floor is installed it will be difficult to feed the straps back in place should they ever become dislodged from the slots. You may wish to apply a few drops of glue to the straps to prevent this.

❏ 2. Glue the two halves of the cockpit floor to the sticks you installed.

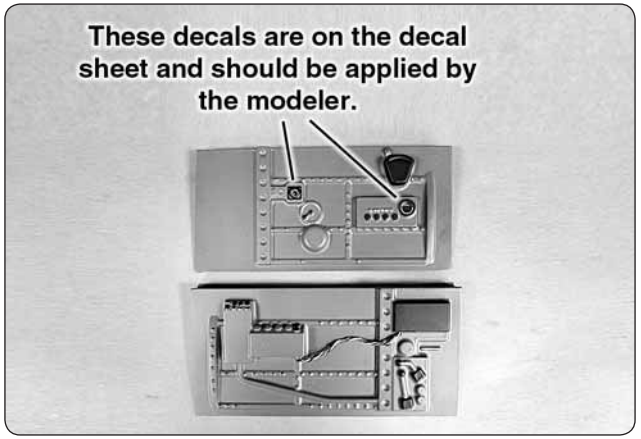


❏ 3. Locate all of the parts of the cockpit.

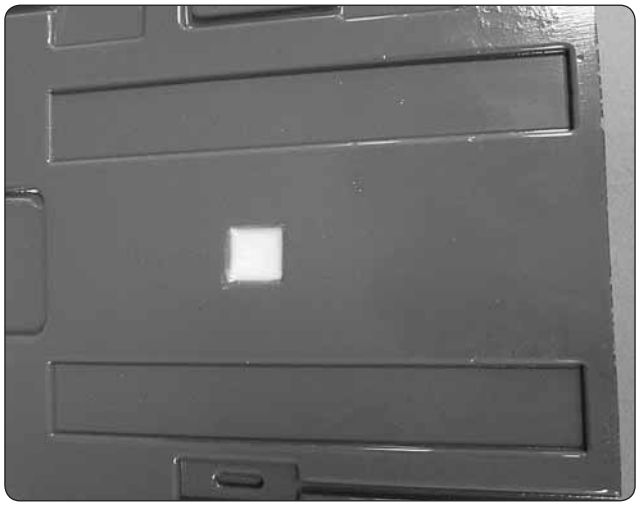
❏ 4. Start the installation by cutting the cockpit floor and fitting it to the fuselage. Do not glue it in place at this time. You will dry fit all of the components before permanently installing them.

❏ 5. Cut the cockpit side as shown, leaving the edge on the top of the side panels. Fit the side panels in place, cutting material from the bottom of the panels until the top edge fits over the fuselage.

❏ 6. Cut the back panel of the cockpit to fit. When you are satisfied with the fit of all the components, remove them from the fuselage.

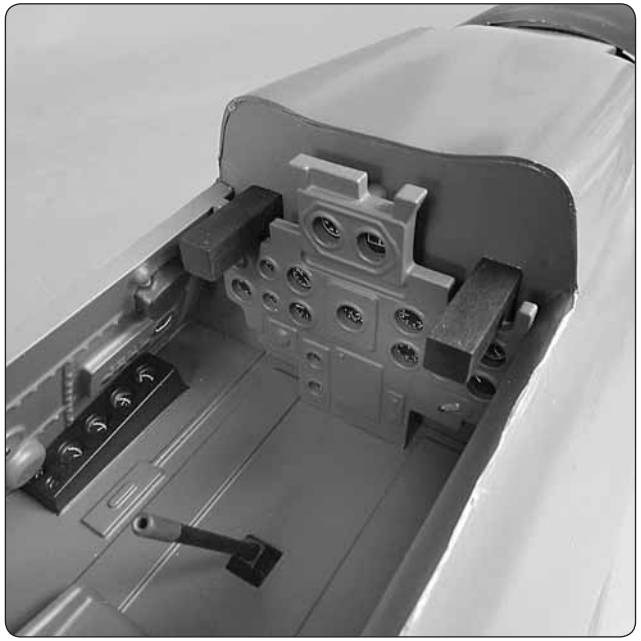


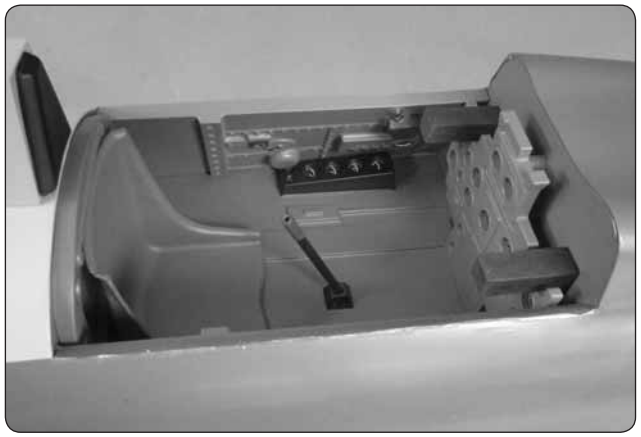
❏ 7. If you wish to do any additional detailing this would be the time to do it. We painted a few of the radio boxes, knobs and levers as well as adding some fine wire for additional detail.



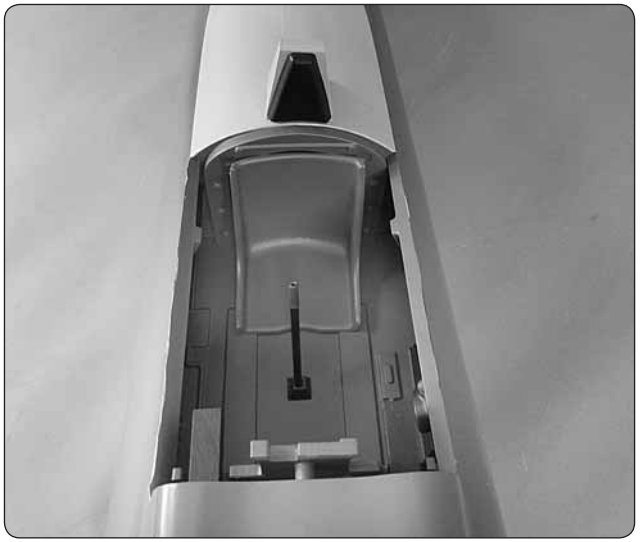
❏ 8. Mix a small amount of epoxy mixed with micro balloons. On the underside of the cockpit floor, fill the void that the flight stick will mount to. Allow the mixture to harden.

❏ 9. Once the glue has hardened drill a 3/16" hole through the top of the area you filled with the epoxy and micro balloons. You will now have a solid area for gluing the flight control stick to. Do not glue the control stick in at this time.





❏ 10. Glue all of the components into place in the cockpit. Use the following photos as a guide; glue everything in place except the control stick. When gluing the seat to the cockpit floor, be sure roughen the bottom of the seat and the floor where the seat will be glued.

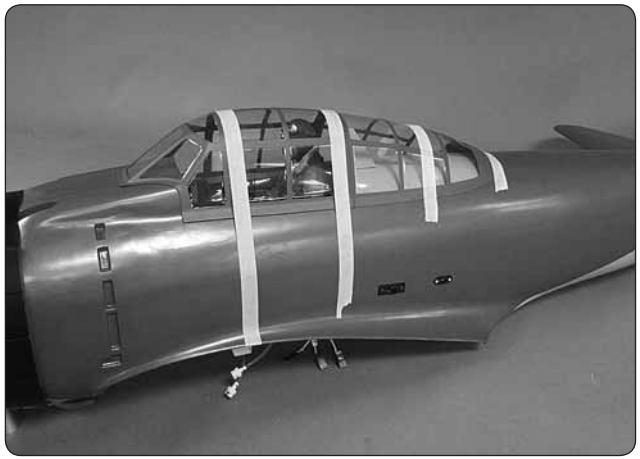


❏ 11. Once the side panels have been glued in place trim the excess plastic material that extends beyond the sides of the fuselage.

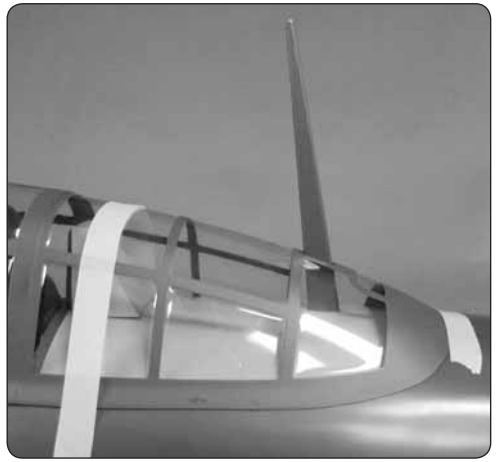
❏ 12. Locate the balsa head rest support and the plastic head rest. Cut the headrest on the cut lines. Glue it to the balsa head rest support. Once the glue has hardened glue the assembly to the top of the fuselage. A glue like RC Z56 or other white aliphatic glue works well. Allow the glue to harden.

❏ 13. If you are installing a pilot, it needs to be installed now. We chose a pilot that was specifically designed for the Top Flite Zero by Best Pilots. This pilot is available both painted and unpainted through their web site; www.bestpilots.typepad.com Whatever pilot you choose, securely glue it in place to the seat.

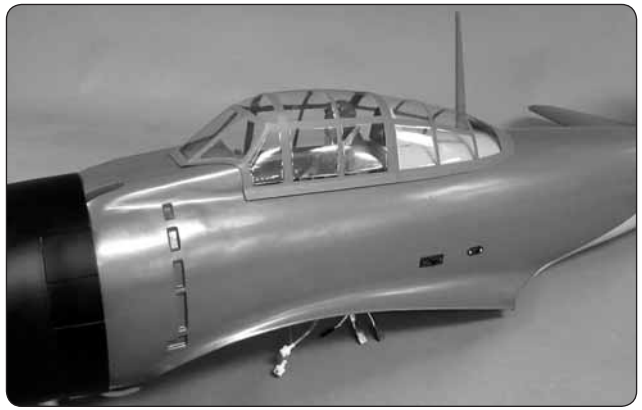
❏ 14. Glue the flight control stick in place in the hole you drilled in the fuselage floor and to the pilot's hand.



❏ 15. Glue the canopy in place with RC Z56. Tape it in place. Quickly move to step 16.



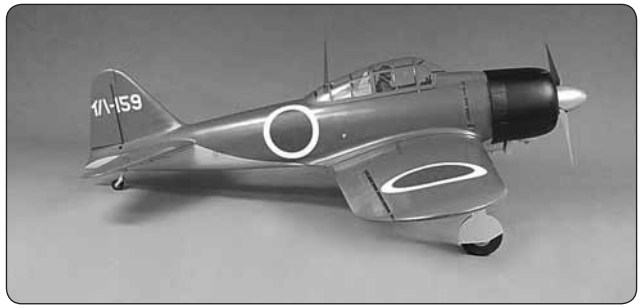
❏ 16. Locate the antenna and place it through the top of the canopy, into the opening in the fuselage. The antenna has magnets embedded in the bottom that will secure it to the fuselage, Use the antenna as a guide to determine the final position of the canopy.

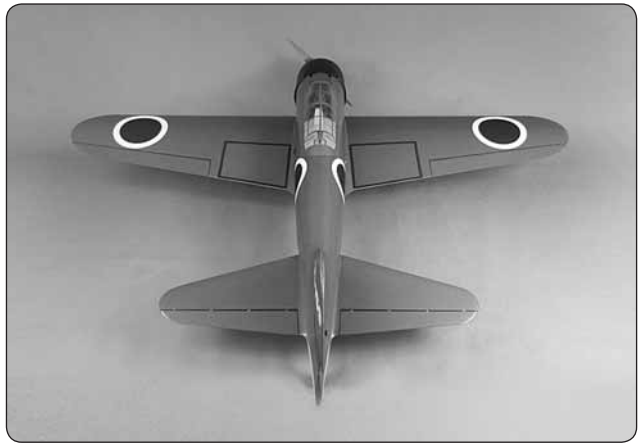


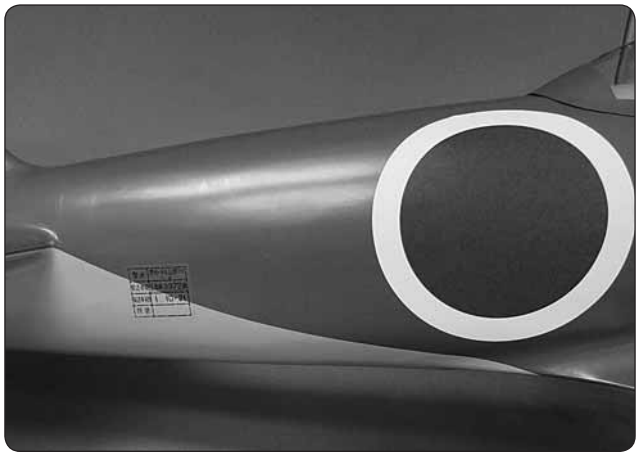
❏ 17. Allow the glue to harden.

APPLY THE DECALS

Refer to these pictures and the pictures on the box to determine the location for the decals. Use the following instructions to apply the decals.







❏ 1. Remove the decals from the sheet.

❏ 2. Be certain the model is clean and free from oily fingerprints and dust. Prepare a dishpan or small bucket with a mixture of liquid dish soap and warm water—about one teaspoon of soap per gallon of water. Submerse the decal in the soap and water and peel off the paper backing. **Note:** Even though the decals have a "sticky-back" and are not the water transfer type, submersing them in soap & water allows accurate positioning and reduces air bubbles underneath.

❏ 3. Position the decals on the model where desired. Holding the decal down, use a paper towel to wipe most of the water away.

❏ 4. Use a piece of soft balsa or something similar to squeegee remaining water from under the decal. Apply the rest of the decals the same way.

❏ 5. We have included a small piece of Olive Drab covering. This can be applied over the access hole in the tail cone with a covering iron set to medium heat setting.

INSTALL THE PROP AND SPINNER

❏ 1. Drill the required mounting holes in the propeller.

❏ 2. Install the prop and spinner. Be sure to apply thread locker to the spinner bolt.

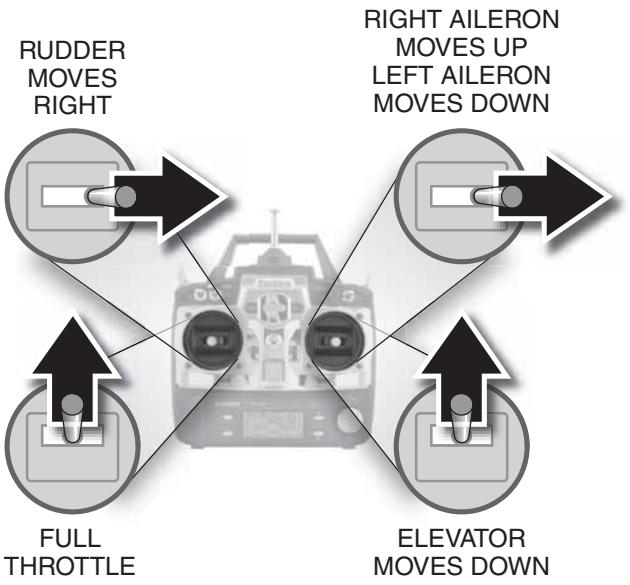
GET THE MODEL READY TO FLY

CHECK THE CONTROL DIRECTIONS

❏ 1. Turn on the transmitter and receiver and center the trims. If necessary, remove the servo arms from the servos and reposition them so they are centered. Reinstall the screws that hold on the servo arms.

❏ 2. With the transmitter and receiver still on, check all the control surfaces to see if they are centered. If necessary, adjust the clevises on the pushrods to center the control surfaces.

4-CHANNEL RADIO SETUP (STANDARD MODE 2)



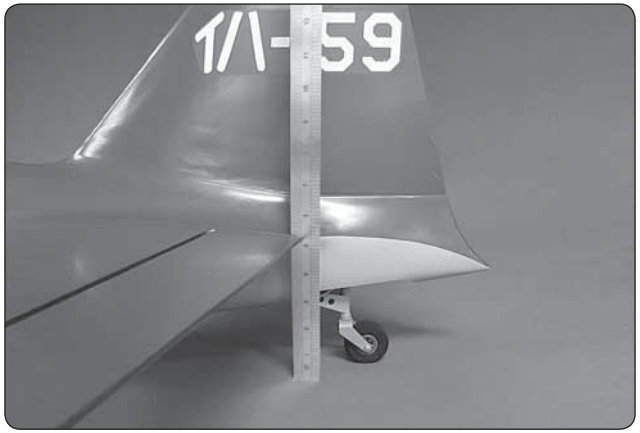
❏ 3. Make certain that the control surfaces and the carburetor respond in the correct direction as shown in the diagram. If any of the controls respond in the wrong direction, use the servo reversing in the transmitter to reverse the servos connected to those controls. Be certain the control surfaces have remained centered. Adjust if necessary.

SET THE CONTROL THROWS

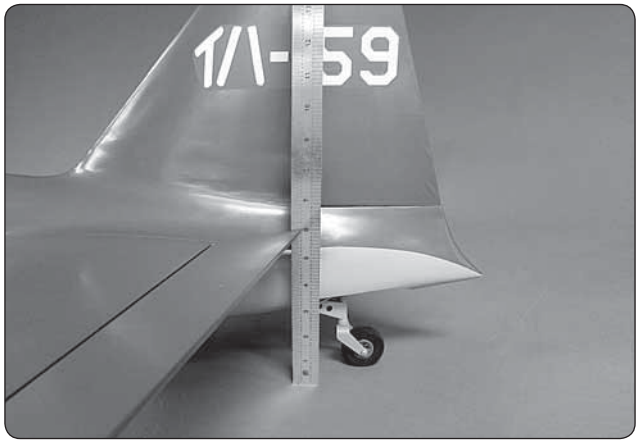
To ensure a successful first flight, set up your Zero according to the control throws specified in this manual. The throws have been determined through actual flight testing and accurate record-keeping allowing the model to perform in the manner in which it was intended. If, after you have become accustomed to the way the Zero flies, you would like to change the throws to suit your taste, that is fine. However, too much control throw could make the model too responsive and difficult to control, so remember, "more is not always better."

❏ 1. Use a box or something similar to prop up the bottom of the fuselage so the horizontal stabilizer and wing will be level.

*Measure the **high rate** elevator throw first…*



❏ 2. Hold a ruler vertically on your workbench against the widest part (front to back) of the trailing edge of the elevator. Note the measurement on the ruler.



❏ 3. Move the elevator up with your transmitter and move the ruler forward so it will remain contacting the trailing edge. The distance the elevator moves up from center is the "up" elevator throw. Measure the down elevator throw the same way.

❏ 4. If necessary, adjust the location of the pushrod on the servo arm or on the elevator horn, or program the ATVs in your transmitter to increase or decrease the throw according to the measurements in the control throws chart.

❏ 5. Measure and set the **low rate** elevator throws and the high and low rate throws for the rest of the control surfaces the same way.

NOTE: The throws are measured at the **widest part** of the elevators, rudder and ailerons.

These are the recommended control surface throws:

	LOW RATE		HIGH RATE	
ELEVATOR	**Up**	**Down**	**Up**	**Down**
	5/8" [16mm] 12°	5/8" [16mm] 12°	7/8" [22mm] 16°	7/8" [22mm] 16°
RUDDER	**Right**	**Left**	**Right**	**Left**
	1-1/2" [38mm] 17°	1-1/2" [38mm] 17°	2" [51mm] 24°	2" [51mm] 24°
AILERONS	**Up**	**Down**	**Up**	**Down**
	5/8" [16mm] 10°	5/8" [16mm] 10°	7/8" [22mm] 14°	7/8" [22mm] 14°
FLAPS	Half Rate	1-3/4" [44mm] 24°	Full Rate	2-1/2" [64mm] 36°

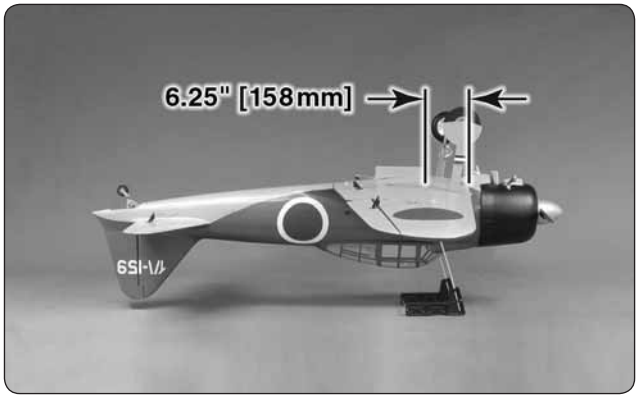
BALANCE THE MODEL (C.G.)

More than any other factor, the C.G. (center of gravity/balance point) can have the greatest effect on how a model flies and could determine whether or not your first flight will be successful. If you value your model and wish to enjoy it for many flights, **DO NOT OVERLOOK THIS IMPORTANT PROCEDURE.** A model that is not properly balanced may be unstable and possibly unflyable.

At this stage the model should be in ready-to-fly condition with **all** of the components in place including the complete radio system, engine, muffler, propeller, spinner and pilot. The fuel tank should be empty.

❏ 1. If using a Great Planes C.G. Machine, set the rulers to 6.25" [158mm]. If not using a C.G. Machine, use a fine-point felt tip pen to mark lines on the top of the wing on both sides of the fuselage 6.25" [158mm] back from the leading edge measured at the fuselage. Apply narrow (1/16" [2mm]) strips of tape over the lines so you will be able to feel them when lifting the model with your fingers.

This is where your model should balance for the first flights. Later, you may experiment by shifting the C.G. 1/2" [13mm] forward or 1/2" [13mm] back to change the flying characteristics. Moving the C.G. forward will improve the smoothness and stability, but the model will then be less aerobatic (which may be fine for less-experienced pilots). Moving the C.G. aft makes the model more maneuverable and aerobatic for experienced pilots. In any case, **start at the recommended balance point** and do not at any time balance the model outside the specified range.



❏ 2. With the wing attached to the fuselage, all parts of the model installed (ready to fly) and an empty fuel tank, place the model upside-down on a Great Planes CG Machine, or lift it upside-down at the balance point you marked.

❏ 3. If the tail drops, the model is "tail heavy." If the nose drops, the model is "nose heavy." Use Great Planes "stick-on" lead (GPMQ4485) to balance the model. To find out how much weight is required, place incrementally increasing amounts of weight on the bottom of the fuselage over the location where it would be mounted inside until the model balances. A good place to add stick-on nose weight is to the firewall. Do not attach weight to the cowl—this will cause the mounting screws to open up the holes in the cowl. Once you have determined the amount of weight required, it can be permanently attached. If required, tail weight may be added by cutting open the bottom of the fuse and gluing it permanently inside.

NOTE: If mounting weight where it may be exposed to fuel or exhaust, do not rely upon the adhesive on the back to permanently hold it in place. Over time, fuel and exhaust residue may soften the adhesive and cause the weight to fall off. Instead, permanently attach the weight with glue or screws.

❏ 4. **IMPORTANT:** If you found it necessary to add any weight, recheck the C.G. after the weight has been installed.

BALANCE THE MODEL LATERALLY

❏ 1. With the wing level, have an assistant help you lift the model by the engine propeller shaft and the bottom of the fuse under the TE of the fin. Do this several times.

❏ 2. If one wing always drops when you lift the model, it means that side is heavy. Balance the airplane by adding weight to the other wing tip. **An airplane that has been laterally balanced will track better in loops and other maneuvers.**

PREFLIGHT

IDENTIFY YOUR MODEL

No matter if you fly at an AMA sanctioned R/C club site or if you fly somewhere on your own, you should always have your name, address, telephone number and AMA number on or inside your model. It is **required** at all AMA R/C club flying sites and AMA sanctioned flying events. Fill out the identification tag on page 38 and place it on or inside your model.

CHARGE THE BATTERIES

Follow the battery charging instructions that came with your radio control system to charge the batteries. You should always charge your transmitter and receiver batteries the night before you go flying, and at other times as recommended by the radio manufacturer.

CAUTION: Unless the instructions that came with your radio system state differently, the **initial** charge on **new** transmitter and receiver batteries should be done for 15 hours **using the slow-charger that came with the radio system**. This will "condition" the batteries so that the next charge may be done using the fast-charger of your choice. If the initial charge is done with a fast-charger the batteries may not reach their full capacity and you may be flying with batteries that are only partially charged.

BALANCE PROPELLERS

Carefully balance your propeller and spare propellers before you fly. An unbalanced prop can be the single most significant cause of vibration that can damage your model. Not only will engine mounting screws and bolts loosen, possibly with disastrous effect, but vibration may also damage your radio receiver and battery. Vibration can also cause your fuel to foam, which will, in turn, cause your engine to run hot or quit.

We use a Top Flite Precision Magnetic Prop Balancer (TOPQ5700) in the workshop and keep a Great Planes Fingertip Prop Balancer (GPMQ5000) in our flight box.

GROUND CHECK AND RANGE CHECK

Run the engine for a few minutes to make sure it idles reliably, transitions smoothly and maintains full power indefinitely. Afterward, shut the engine off and inspect the model closely, making sure all fasteners, pushrods and connections have remained tight and the hinges are secure. Always ground check the operational range of your radio before the first flight of the day following the manufacturer's instructions that came with your radio. This should be done once with the engine off and once with the engine running at various speeds. If the control surfaces do not respond correctly, **do not**

fly! Find and correct the problem first. Look for loose servo connections or broken wires, corroded wires on old servo connectors, poor solder joints in your battery pack or a defective cell, or a damaged receiver crystal from a previous crash.

ENGINE SAFETY PRECAUTIONS

Failure to follow these safety precautions may result in severe injury to yourself and others.

Keep all engine fuel in a safe place, away from high heat, sparks or flames, as fuel is very flammable. Do not smoke near the engine or fuel; and remember that engine exhaust gives off a great deal of deadly carbon monoxide. Therefore **do not run the engine in a closed room or garage**.

Get help from an experienced pilot when learning to operate engines.

Use safety glasses when starting or running engines.

Do not run the engine in an area of loose gravel or sand; the propeller may throw such material in your face or eyes.

Keep your face and body as well as all spectators away from the plane of rotation of the propeller as you start and run the engine.

Keep these items away from the prop: loose clothing, shirt sleeves, ties, scarfs, long hair or loose objects such as pencils or screwdrivers that may fall out of shirt or jacket pockets into the prop.

Make all engine adjustments from behind the rotating propeller.

The engine gets hot! Do not touch it during or right after operation. Make sure fuel lines are in good condition so fuel will not leak onto a hot engine, causing a fire.

To stop a gasoline powered engine an on/off switch should be connected to the engine coil. Do not throw anything into the propeller of a running engine.

AMA SAFETY CODE EXCERPTS

Read and abide by the following excerpts from the Academy of Model Aeronautics Safety Code. For the complete Safety Code refer to *Model Aviation* magazine, the AMA web site or the Code that came with your AMA license.

GENERAL

1) I will not fly my model aircraft in sanctioned events, air shows, or model flying demonstrations until it has been proven to be airworthy by having been previously, successfully flight tested.

2) I will not fly my model aircraft higher than approximately 400 feet within 3 miles of an airport without notifying the airport operator. I will give right-of-way and avoid flying in the proximity of full-scale aircraft. Where necessary, an observer shall be utilized to supervise flying to avoid having models fly in the proximity of full-scale aircraft.

3) Where established, I will abide by the safety rules for the flying site I use, and I will not willfully and deliberately fly my models in a careless, reckless and/or dangerous manner.

5) I will not fly my model unless it is identified with my name and address or AMA number, on or in the model. Note: This does not apply to models while being flown indoors.

7) I will not operate models with pyrotechnics (any device that explodes, burns, or propels a projectile of any kind).

RADIO CONTROL

1) I will have completed a successful radio equipment ground check before the first flight of a new or repaired model.

2) I will not fly my model aircraft in the presence of spectators until I become a qualified flier, unless assisted by an experienced helper.

3) At all flying sites a straight or curved line(s) must be established in front of which all flying takes place with the other side for spectators. Only personnel involved with flying the aircraft are allowed at or in the front of the flight line. Intentional flying behind the flight line is prohibited.

4) I will operate my model using only radio control frequencies currently allowed by the Federal Communications Commission.

5) **I will not knowingly operate my model within three miles of any pre-existing flying site except in accordance with the frequency sharing agreement listed** [in the complete AMA Safety Code].

9) Under no circumstances may a pilot or other person touch a powered model in flight; **nor should any part of the model other than the landing gear, intentionally touch the ground, except while landing.**

CHECK LIST

During the last few moments of preparation your mind may be elsewhere anticipating the excitement of the first flight. Because of this, you may be more likely to overlook certain checks and procedures that should be performed before the model is flown. To help avoid this, a check list is provided to make sure these important areas are not overlooked. Many are covered in the instruction manual, so where appropriate, refer to the manual for complete instructions. Be sure to check the items off as they are completed (that's why it's called a *check list!*).

❏ 1. Fuelproof all areas exposed to fuel or exhaust residue such as the cowl ring, cowl mounting blocks, wing saddle area, etc.

❏ 2. Check the C.G. according to the measurements provided in the manual.

❏ 3. Be certain the battery and receiver are securely mounted in the fuse. Simply stuffing them into place with foam rubber is not sufficient.

❏ 4. Extend your receiver antenna and make sure it has a strain relief inside the fuselage to keep tension off the solder joint inside the receiver.

❏ 5. Balance your model *laterally* as explained in the instructions.

❑ 6. Use threadlocking compound to secure critical fasteners such as the set screws that hold the wheel axles to the struts, screws that hold the carburetor arm (if applicable), screw-lock pushrod connectors, etc.

❑ 7. Add a drop of oil to the axles so the wheels will turn freely.

❑ 8. Make sure all hinges are **securely** glued in place.

❑ 9. Reinforce holes for wood screws with thin CA where appropriate (servo mounting screws, cowl mounting screws, etc.).

❑ 10. Confirm that all controls operate in the correct direction and the throws are set up according to the manual.

❑ 11. Make sure there are silicone retainers on all the clevises and that all servo arms are secured to the servos with the screws included with your radio.

❑ 12. Secure connections between servo wires and Y-connectors or servo extensions, and the connection between your battery pack and the on/off switch with vinyl tape, heat shrink tubing or special clips suitable for that purpose.

❑ 13. Make sure any servo extension cords you may have used do not interfere with other systems (servo arms, pushrods, etc.).

❑ 14. Secure the pressure tap (if used) to the muffler with high temp RTV silicone, thread locking compound or J.B. Weld.

❑ 15. Make sure the fuel lines are connected and are not kinked.

❑ 16. Balance your propeller (and spare propellers).

❑ 17. Tighten the propeller nut and spinner.

❑ 18. Place your name, address, AMA number and telephone number on or inside your model.

❑ 19. Cycle your receiver battery pack (if necessary) and make sure it is fully charged.

❑ 20. If you wish to photograph your model, do so before your first flight.

❑ 21. Range check your radio when you get to the flying field.

FLYING

IMPORTANT!!! The Zero does not possess the self-recovery characteristics of a primary R/C trainer and should be flown only by experienced R/C pilots.

FUEL MIXTURE ADJUSTMENTS

A fully cowled engine may run at a higher temperature than an un-cowled engine. For this reason, the fuel mixture should be richened so the engine runs at about 200 rpm below peak speed. By running the engine slightly rich, you will help prevent dead-stick landings caused by overheating.

CAUTION (THIS APPLIES TO ALL R/C AIRPLANES): If, while flying, you notice an alarming or unusual sound such as a low-pitched "buzz," this may indicate control surface *flutter.* Flutter occurs when a control surface (such as an aileron or elevator) or a flying surface (such as a wing or stab) rapidly vibrates up and down (thus causing the noise). In extreme cases, if not detected immediately, flutter can actually cause the control surface to detach or the flying surface to fail, thus causing loss of control followed by an impending crash. The best thing to do when flutter is detected is to slow the model **immediately** by reducing power, then land as soon as safely possible. Identify which surface fluttered (so the problem may be resolved) by checking all the servo grommets for deterioration or signs of vibration. Make certain all pushrod linkages are secure and free of play. If it fluttered once, under similar circumstances it will probably flutter again unless the problem is fixed. Some things which can cause flutter are; Excessive hinge gap; Not mounting control horns solidly; Poor fit of clevis pin in horn; Side-play of wire pushrods caused by large bends; Excessive free play in servo gears; Insecure servo mounting; and one of the most prevalent causes of flutter; Flying an over-powered model at excessive speeds.

TAKEOFF

Before you get ready to takeoff, see how the model handles on the ground by doing a few practice runs at **low speeds** on the runway. Hold "up" elevator to keep the tail wheel on the ground. If necessary, adjust the tail wheel so the model will roll straight down the runway. If you need to calm your nerves before the maiden flight, shut the engine down and bring the model back into the pits. Top off the fuel, then check all fasteners and control linkages for peace of mind.

The Zero has a wide landing gear stance making ground handling very good and relatively easy for maintaining straight take-offs. Taking off directly into the wind makes ground handling relatively easy. We would recommend that whenever possible you take off and land directly into the wind. Taking off in a cross wind or landing cross wind you will need to be quick on the rudder and may need to use ailerons to help keep the wing level during the take off or landing roll out.

When you're ready, point the model straight down the runway, directly into the wind, and hold a bit of up elevator to keep the tail on the ground to maintain tail wheel steering, then gradually advance the throttle. As the model gains speed decrease up elevator allowing the tail to come off the ground. One of the most important things to remember with a tail dragger is to always be ready to apply **right** rudder to counteract engine torque. Gain as much speed as your runway and flying

site will practically allow before gently applying up elevator, lifting the model into the air. At this moment it is likely that you will need to apply more right rudder to counteract engine torque. Be smooth on the elevator stick, allowing the model to establish a **gentle** climb to a safe altitude before turning into the traffic pattern. Raise the landing gear.

FLIGHT

For reassurance and to keep an eye on other traffic, it is a good idea to have an assistant on the flight line with you. Tell him to remind you to throttle back once the plane gets to a comfortable altitude. While full throttle is usually desirable for takeoff, most models fly more smoothly at reduced speeds.

Take it easy with the Zero for the first few flights, gradually getting acquainted with it as you gain confidence. Adjust the trims to maintain straight and level flight. After flying around for a while, and while still at a safe altitude with plenty of fuel, practice slow flight and execute practice landing approaches by reducing the throttle to see how the model handles at slower speeds. Add power to see how she climbs as well. Continue to fly around, executing various maneuvers and making mental notes (or having your assistant write them down) of what trim or C.G. changes may be required to fine tune the model so it flies the way you like. Mind your fuel level, but use this first flight to become familiar with your model before landing.

Identification Tag

This model belongs to:

Name

Address

City, State, Zip

Phone Number

AMA Number

The Zero is a very solid flying airplane. It will perform all of the typical maneuvers a WWII fighter was capable of. Loops, rolls and hammerheads are performed as you would expect. With the landing gear retracted, there is nothing more impressive than a high speed fly by to show off the airplane to all of those watching. The airplane has a wide flight envelope. When the landing gear is retracted and the throttle fully open the airplane is fast. With the flaps deployed the airplane flies very slow, yet remains stable. When you deploy the flaps expect it to balloon a bit. It is not severe but watch for it. We found that if you mix in 2 degrees of down elevator when the flaps are fully deployed that the ballooning was eliminated. We recommend you spend some time flying with the flaps deployed, flying at slower speeds.

LANDING

To initiate a landing approach, put the gear down, and lower the throttle while on the downwind leg. Allow the nose of the model to pitch downward to gradually bleed off altitude. Continue to lose altitude, but maintain airspeed by keeping the nose down as you turn onto the crosswind leg. In the crosswind leg deploy the flaps. Make your final turn toward the runway (into the wind) keeping the nose down to maintain airspeed and control. Level the attitude when the model reaches the runway threshold, modulating the throttle as necessary to maintain your glide path and airspeed. If you are going to overshoot, smoothly advance the throttle (always ready on the right rudder to counteract torque) and climb out to make another attempt. When you're ready to make your landing flare and the model is a foot or so off the deck, smoothly increase up elevator until it gently touches down. Once the model is on the runway and has lost flying speed, hold up elevator to place the tail on the ground, regaining tail wheel control.

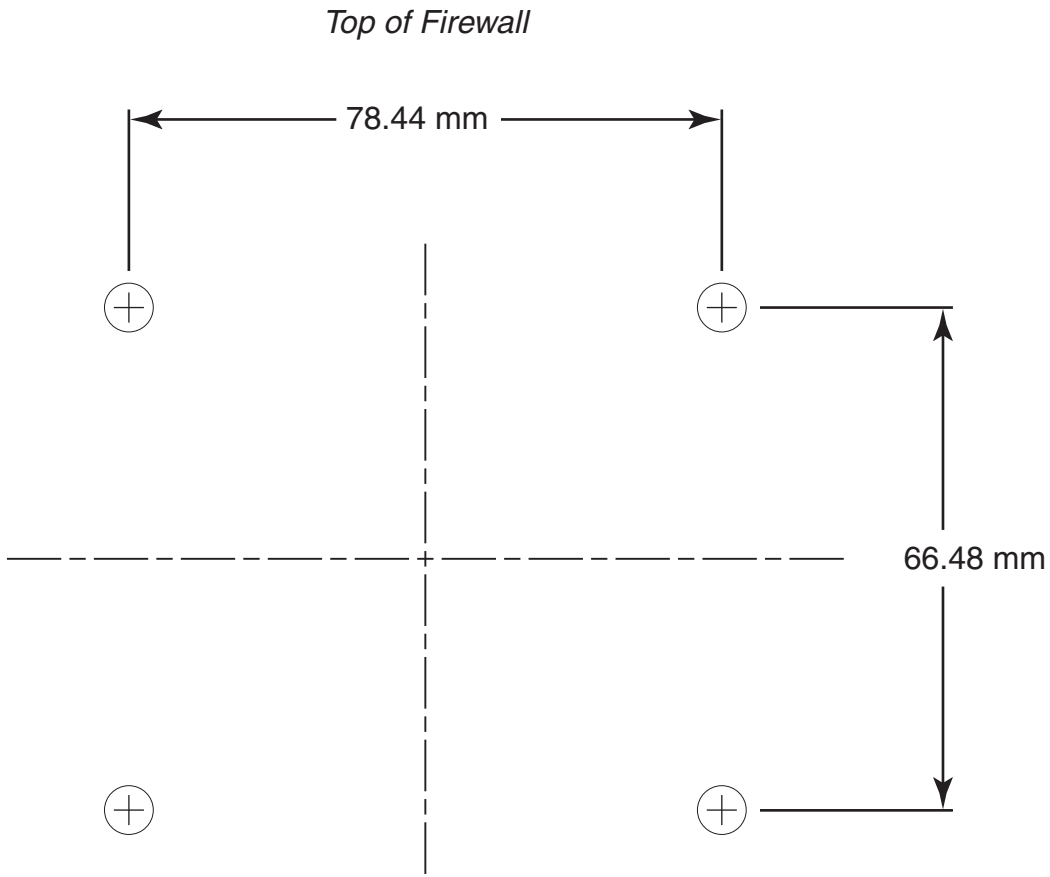
If you are not accustomed to an airplane with flaps you will discover that landings are slightly different. A typical model without flaps will generally initiate a landing approach with a gradual reduction in altitude so that on the final approach you will be at a fairly low altitude and will drive the airplane to the runway. The Zero lands best if you make your final approach at about 100 feet (30 meters) as you approach the end of the runway. Gradually reduce your speed, and point the nose towards the end of the runway, maintaining a steady descent. Level the airplane about three feet (1 meter) above the runway and allow the plane to touch down on the main gear and roll out until the tail naturally settles onto the runway.

One final note about flying your model. Have a goal or flight plan in mind for **every** flight. This can be learning a new maneuver(s), improving a maneuver(s) you already know, or learning how the model behaves in certain conditions (such as on high or low rates). This is not necessarily to improve your skills (*though it is never a bad idea!)*, but more importantly so you do not surprise yourself by impulsively attempting a maneuver and suddenly finding that you've run out of time, altitude or airspeed. Every maneuver should be deliberate, not impulsive. For example, if you're going to do a loop, check your altitude, mind the wind direction (anticipating rudder corrections that will be required to maintain heading), remember to throttle back at the top, and make certain you are on the desired rates (high/low rates). A flight plan greatly reduces the chances of crashing your model just because of poor planning and impulsive moves. **Remember to think.**

Have a ball! But always stay in control and fly in a safe manner.

GOOD LUCK AND GREAT FLYING!

OS GT60 Mounting Pattern



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